Garnet Stars & Sands

Draft Environmental Impact Statement

September 2001

St. Joe Ranger District
Idaho Panhandle National Forests

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Garnet Stars And Sands

Draft Environmental Impact Statement

Idaho Panhandle National Forests

St. Joe Ranger District

Latah, Shoshone and Benewah Counties, Idaho

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Abstract:

The Garnet Stars and Sands Draft Environmental Impact Statement analyzes the effects of expanding the recreational garnet digging area and allowing testing for leasable garnets in several drainages in the St. Maries River Basin. Alternative A is the no action alternative. Recreational digging would eventually run out in currently developed areas and lease applications would be denied. Alternative B is the proposed action. The project would test and develop future recreational garnet digging opportunities and address whether to approve the twelve pending garnet sands or gemstone lease renewals, lease applications, permit applications and /or extensions. Garnets would be commercially mined. Alternative C was developed to address potential effects of Alternative B on water quality, fisheries and riparian habitats. This alternative would allow the same recreational development and lease renewals, applications and permit applications and extensions, except that potential commercial sand mining activities would occur at least 30 feet from the East Fork and West Fork of Emerald Creeks.

The Forest Service believes, at this early stage, it is important to give reviewers notice of several court rulings related to public participation in the environmental review process. First, reviewers of draft environmental impact statements must structure their participation in the environmental review of the proposal so that it is meaningful and alerts an agency to the reviewer's position and contentions. *Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1973).* Also, environmental objections that could be raised at the draft environmental impact statement stage but that are not raised until after completion of the final environmental impact statement may be waived or dismissed by the courts. *City of Amgoon v. Hodel,* 803 F.2d 1016, 1022 (9th Cir. 1986) and *Wisconsin Heritages, Inc. v. Harris*, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Because of these court rulings, it is very important that those interested in this proposed action participate by the close of the **45-day comment period** so that substantive comments and objections are made available to the Forest Service at a time when it can meaningfully consider them and respond to them in the final environmental impact statement.

To assist the Forest Service in identifying and considering issues and concerns on the proposed action, comments on the draft environmental impact statement should be as specific as possible. It is also helpful if comments refer to specific pages or chapters of the draft statement. Comments may also address the adequacy of the Draft Environmental Impact Statement or the merits of the alternatives formulated and discussed in the statement. Reviewers may wish to refer to the Council on Environmental Quality Regulations for implementing the procedural provisions of the National Environmental Policy Act at 40 CFR 1503.3 in addressing these points.

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List of Tables and Figures

CHAPTER 1 - PURPOSE AND NEED

This Environmental Impact Statement for the St. Joe Ranger District of the Idaho Panhandle National Forests addresses recreational digging and leasing of garnet mineral resources in the Emerald, Hidden, Wood and Cat Spur Creek drainages (see Map 1-1 – Vicinity and Project Area Map on page 1-9). **Decisions need to be made whether to test and develop future recreational garnet digging opportunities and whether to approve the twelve pending garnet sands or gemstone lease renewals, lease applications, permit applications and /or extensions.** The responsible official for this decision is the Forest Supervisor, Idaho Panhandle National Forests, 3815 Schreiber Way, Coeur d'Alene, Idaho 83815.

Project Area and Background

The Garnet Stars and Sands Project Area is approximately 32,000 acres located in Latah, Shoshone and Benewah Counties of Idaho; approximately 65% is National Forest land. The Project Area includes Emerald, Wood, Hidden and Catspur Creek drainages (T42N, R1E, R2E and R1W, Boise Meridian). These areas are defined by the same underlying geology. The project area drains into the West Fork of St. Maries River.

In the past, the infrequent prospecting permits and subsequent lease applications for this project area were handled on a case-by-case basis. More recently, a higher level of interest in the garnet mineral resource has resulted in more minerals applications. In addition, the recreational garnet area is possibly nearing the end of digging at the present site in 281 Gulch. Forest Service land managers decided that National Forest land overlying the garnet resource should be reviewed as a whole, i.e. the big picture should be reviewed. A comprehensive management plan for the area should help avoid conflicts and conserve the garnet resource for future generations. A cooperative study of the garnet resource was conducted with US Geological Survey geologists (USGS and FS, 2000). Its information has provided a basis from which to begin this analysis.

The underlying geology of the project area contains garnet sands and gemstones. Garnet size varies directly with location in the drainage, with larger garnets found in upper valleys, closer to the parent material. Garnet sand concentrations sufficient for commercial mining are found in the Emerald Creek basin. The garnet sands have a durability and hardness that allow the garnet to be successfully milled into many grades (sizes) of product that are then recycled numerous times in most industrial applications. The various grades of sands are considered high quality for oil well fracking and packing, oil pipelines, water filtration, water jet cutting, abrasive blasting and polishing. There is world-wide demand for these products. Like all mineral resources, garnets are a finite resource.

The Project Area also produces extraordinary quality and quantity of large garnets, with some of the drainages producing star garnets. Emerald Creek is the only site in the United States and is one of only two places in the world (the other is India) where star garnets are found. These gemstones are used commercially for jewelry and are sought after by recreationists.

Much of the Emerald Creek drainage, on public and private lands, has been commercially mined for garnet in the past. Two lease renewals, one new lease application, one prospecting permit extension, and eight new prospecting permit applications have been

submitted. In addition, the Forest Service currently manages a public digging area (by fee permit) in 281 Gulch, a tributary to Emerald Creek. People come from all over the world to visit the Emerald Creek Garnet Area and dig for gemstones.

THE PURPOSE AND NEED

The purpose and need for this project is based on Forest Service policy and direction given in the Idaho Panhandle National Forest's Forest Plan (1987 – referred to as the Forest Plan from here on).

Forest Service Policy for Acquired Lands

Most of the National Forest system lands within the project area were either acquired through land donations or land exchanges (Weeks Law, Clarke –McNary, General Exchange Act and Administrative Sites Act) (see Map 3-2 on page 1-10). These acquired lands are not open to mineral entry under the General Mining Laws as are most other National Forest system lands in the West. Whether or not to develop minerals in these acquired lands is a discretionary decision. These minerals are subject mineral leasing laws and procedures (For more detail on laws and authorities, see the Minerals Section in Chapter 3 and Appendix B). Mineral development is also authorized (Section 402 of Reorganization Plan No. 3 of July 16, 1946) and allows development when it will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as specified by the Secretary of Agriculture in order to protect such purposes.

The lands acquired within the Project Area were mostly acquired in the 1930s and 1960 – 1970s. (See Map 1-2 on page 1-11) In general, the lands acquired in the 1930s were acquired for the purposes of land consolidation and forestry. The references indicate that the thinking at the time was that land consolidation made land management more efficient. The project area land exchanges in the 1960-70s were acquired for the purposes of garnet collecting and land consolidation. These exchanges received a great deal of publicity and subsequent comment from the public. The public demonstrated enormous support to maintain opportunities for recreational gem- collecting. In fact, in July 1969, Congressman James McClure introduced a Bill, H.R. 13141, to establish the Idaho Star Garnet National Recreation Area (Project Files Background Document). These pieces of land were considered key to consolidating National Forest land and improving recreation management of rock hound activities for removal of gem –quality garnets. Land appraisals for the exchanges included garnet sands, timber and land valuations.

Congress reiterated its intent to allow mineral development under appropriate circumstances when it enacted the Mining and Minerals Policy Act of 1970 (84 Stat. 1876; 30 USC 21, a). The act states;

> "The Congress declares that it is the continuing policy of the Federal Government in the national interest to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining, mineral, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction of industrial, security and environmental needs…"

Forest Plan Direction

The Forest Plan specifically states that the Emerald Creek Garnet Area will be managed to provide a unique rockhound experience (See below under Management Area 4). Commercial mineral development is addressed in the Forest Plan Record of Decision (FP, ROD, page 8) "All lands on the Idaho Panhandle National Forests are available for mineral leasing unless formally withdrawn". Some of the Forest-wide standards (pg II-34) for minerals are:

1. In compliance with mining laws and regulations the IPNF will administer lands in cooperation with developers of the minerals resource, recognizing this value as a National Forest resource.
2. Maintain an active liaison with local mining industry and mining associations. Cooperate with federal and state agencies charged with the responsibility of administering laws, rules and regulations pertaining to the minerals resource and mining operations.
3. Facilitate the exploration and development of critical minerals to the extent practicable, consistent with protection and management of surface resources.
4. Before recommendations are made on any lease application, additional NEPA site-specific analysis of environmental effects will be made.

Some of the Forest-wide standards (pg II-24) for recreation are:

1. The Forest will continue to provide a share of recreation opportunities and diversity in relation to other public and private entities;
2. Provide a broad spectrum of dispersed and developed recreation opportunities in accord with identified needs and demands.

The project area is located in the following Forest Plan Management Areas (MA):

- MA 1 (13,600 acres)
- MA 4 (11,500 acres): under MA1 and MA 4, the Forest Plan states "The Emerald Creek Garnet area will be managed to provide a unique recreation rockhound experience and in accord with its current management direction.
- MA 5 (325 acres)
- MA 15 (grazing uses)
- MA 16 (riparian areas)

There are no specific standards for minerals in the Forest Plan by individual Management Area. More information for each Management Area can be found in the Forest Plan.

Purpose and Need

The garnet resource is finite and valuable. There is considerable public interest in leasing of gemstones and sands and retaining a recreational digging area, due to expected benefits of jobs, employment and income. The Purpose and Need for this project is as follows:

1. Respond to public interest in developing the garnet mineral resource for both recreational garnet digging and commercial gemstones and sands.

There is considerable public support for present and future recreational garnet digging to continue. Commercial interest is also high as there are prospecting permit and lease applications for both gemstones and sands.

2. Identify, test and develop other areas for the Forest Service to provide the unique recreational digging opportunity.

The garnet digging area in Emerald Creek is one of the most popular attractions on the St. Joe Ranger District. These gemstone deposits within the current Forest Service recreational digging area in 281 Gulch are becoming depleted. We estimate that there is 2-5 years left of digging in this gulch. A study done in conjunction with the United States Geological Survey was completed to determine the location of known or suspected deposits of both forms of garnet. This study is used as a basis for analysis but the full extent of the garnet resource needs to be mapped and proven with field- testing.

3. Resolve twelve pending mining applications or extensions.

A decision needs to be made on 1 lease application, 2 lease renewals, 8 prospecting permit applications and 1 prospecting permit extension for both gemstones and sand dating from 1996.

PROPOSED ACTION

The proposed action includes testing for garnet gemstones, maintaining a recreational digging area and granting the lease applications, lease renewal, prospecting permits and prospecting permit extension with incorporated design features to protect resources. A detailed description is listed below. Gaining the right to develop and produce Federal hardrock minerals (such as garnets) beneath acquired Forest Service lands is generally a two stage process involving the issuance of prospecting permits, then preference right leases. **A NEPA decision is required for both stages.**

For this EIS regarding the prospecting permits, this analysis examines both the current prospecting permit application **and** potential development. Potential development would likely be submitted in the form of a lease application and operating plan after testing is complete, which would require another NEPA decision before implementation. Analysis of the potential development is being done at this time with the hope that this larger analysis will facilitate subsequent analysis and NEPA decision when or if a lease application and Plan of Operations are submitted.

1) Public Recreational Gemstone Digging Areas

The Forest Service would reserve Wood Creek and certain tributaries of the East Fork of Emerald Creek (281 Gulch, Garnet Gulch, No Name, PeeWee and Strom Creeks) for public recreational digging of gemstone garnets. These areas would not be available for commercial lease.

These drainages would be tested with a combination of auger holes and hand and machine - dug trenches. After testing, drainages will be listed in order of priority for development. The drainage with the best opportunities and cost effectiveness would be developed after

operations in 281 Gulch ceased. Different development would be required within each drainage. The mitigations and design features outlined in Chapter 2 would be adhered to.

Details By Drainage

281 Gulch: Progressive digging would continue in the two forks to the confluence of the East and West Forks. Digging would then continue on the main fork of 281 Gulch to Road 447. Overburden removal would be needed.

Garnet Gulch: The original parking area for Pee Wee and No Name Creeks would be used for this drainage. The a-frame would be located at the parking area and a toilet facility installed. An estimated ½ mile trail would be constructed. Some overburden removal may be necessary.

PeeWee and No Name Creeks: These drainages have been recreational digging areas previously and are known to have high quality gemstones. Collecting in the past was done primarily with hand digging and it is believed that there may be more resource available if overburden can be removed. Development would include a toilet facility but the parking and other site space still exist. These two areas shared parking areas. Overburden removal is likely going to be necessary.

Wood Creek: Parking and a site for the a-frame and toilet would be developed. Some overburden removal may be necessary.

Strom Gulch: Only testing at this time will be completed in this drainage. Further development is not foreseen within the next ten years.

2) Lease Application

The pending lease application (ID 29529) for gemstones on Bechtel Butte would be approved. This entails the following: 5 to 6 pits 15 feet in diameter; one backhoe trench 100 feet long by 20 feet wide and 8 feet deep on the ridge; a bobcat excavator would be used to fill in and dig smaller trenches (within T42N, R1E, Sections 9, 10, 15 and 16). It is expected that these activities would begin in 2002 and continue through 2007.

3) Prospecting Permits

Prospecting permits authorize exploration, which could lead to further development applied for in the form of a lease application. To perform an efficient analysis **for some of the permits where we have substantive information**, we are analyzing possible subsequent development as long as analysis shows that it can be done within relevant laws and regulations. When or if a lease application is filed, then another NEPA decision would be required but it is likely that much of the analysis and pre-work would be complete with this document.

The pending prospecting permit applications (ID 31439, 31440, 31441, 31442, 31443, 31444) and prospecting permit extension (ID 29619) for garnet sands would be approved. Specifically this entails five backhoe trenches approximately 15 ft by 10 ft by 15 ft (2 in the East Fork of Emerald Creek, 2 in Bechtel Creek and 1 in Hidden Creek).

For the area under these permits, ID 31439-31444 and 29619, the potential subsequent development is analyzed:

> Mining of garnet sands on National Forest lands along the East and West Forks of Emerald Creek would be proposed later and would require another NEPA document and decision. This would likely include the wider and more accessible portions of the East Fork from the west line of T42N, R1E, Section 18 (between Flat Creek and Strom Gulch, approximately 10,000 feet) to near the confluence of the East and West Forks of Emerald Creek. Some portions of Road 447 may be rerouted around mining operations and replaced afterward. Some portions of the creek channel would be temporarily relocated for mining and then rebuilt. A similar mining scenario would take place in the West Fork on approximately 25 acres (½ mile of stream). The West Fork operations would begin at the upstream end and take two summer seasons beginning in the year 2003. The total East Fork operations would begin at the upstream end of the creek and would last 7-10 summer seasons starting in 2003. The West Fork location would take 2 summer seasons to complete (Pers. Communication, S. Osborne, Emerald Creek Garnet Co.). West Fork locations are : T43N, R1E, Section 33 and T42N, R1E, Section 4. East Fork locations are: T42N, R1W, Sections 13 and 14; T42N, R1E, Sections 3,8,9,17, and 18.
>
> Other areas would be explored for possible future mining development of garnet sands. However, the probability of mining activity here is less certain and will not be analyzed at this time. Any development of these other drainages would likely be applied for after the mining in the East and West Forks is complete.
>
> The pending prospecting permit application (ID 33036/ amended application (4/2/2001)) for garnet gemstones would be approved. This entails hand-dug trenches in a tributary to Cat Spur Creek. No assumptions for further development will be made at this time. (T42N, R2E, Section 19)
>
> The pending prospecting permit application (ID 32421) for garnet sands on Bechtel Butte would be approved. This entails three hand-dug trenches 10 ft x 12 ft. No assumptions for further development will be made at this time. (T42N, R1E, Sections 9, 10, 15, 16).

4) Lease Renewal

The pending lease renewal applications (ID 016415 and 25554) would be approved. There is planned development and mining for garnet sands on approximately eight acres in Section 9 on the East Fork of Emerald Creek; these operations would likely occur in the last third of the 7-10 year mining period for mining the East Fork. The Plan of Operations would require another NEPA analysis and decision. Remaining areas of the lease have already been mined and reclaimed. (T42N, R1E, Section 9)

5) Conditions and Reclamation

The conditions and reclamation requirements under which any recreational and commercial garnet mining could be implemented are developed and presented in Chapter 2 of this EIS.

6) Forest Plan Amendment and Other Agency Permits

The garnet resource in Emerald Creek and related Forest Plan standards supporting its development were not considered in the INFISH Amendment to the Idaho Panhandle Forest Plan (1995). Consequently, the Forest Service is in the process of determining the intent of the INFISH standards as they apply to operations such as these on acquired lands. It is possible that a non-significant, site-specific Forest Plan Amendment would be required.

It is also possible that this proposal would require a non-significant Forest Plan amendment regarding mining development if some areas are restricted from development. For Alternatives B and C there are six drainages that would not be available for commercial lease. For Alternative A, none of the area would be available for commercial lease nor would the Emerald Creek Garnet Area be in operation after 281 Gulch was completed. More alternatives could be developed between the Draft and Final EIS. Dependent on which alternative is selected after the Final EIS, an amendment to the Forest Plan may be needed.

The proposed action allows for commercial leasing of gemstones and sands, which requires permit approval and implementation by the Bureau of Land Management. Project implementation for both recreational digging and commercial development within floodplains would require Corps of Engineers Permits (404 permits) and State of Idaho permits.

SCOPE OF THE PROJECT

The scope of the project is defined by the Purpose and Need stated earlier, proposed activities described in Chapter 2, the effects the proposed activities may have on resources identified in Chapter 3 and the administrative authority granted to the Idaho Panhandle Forest Supervisor (Responsible Official).

The scope of the proposed activities and various alternatives addressed in this DEIS includes testing and recreational garnet digging development in Emerald Creek, resolution of pending lease application, prospecting permits, and existing lease renewals as noted earlier in this chapter.

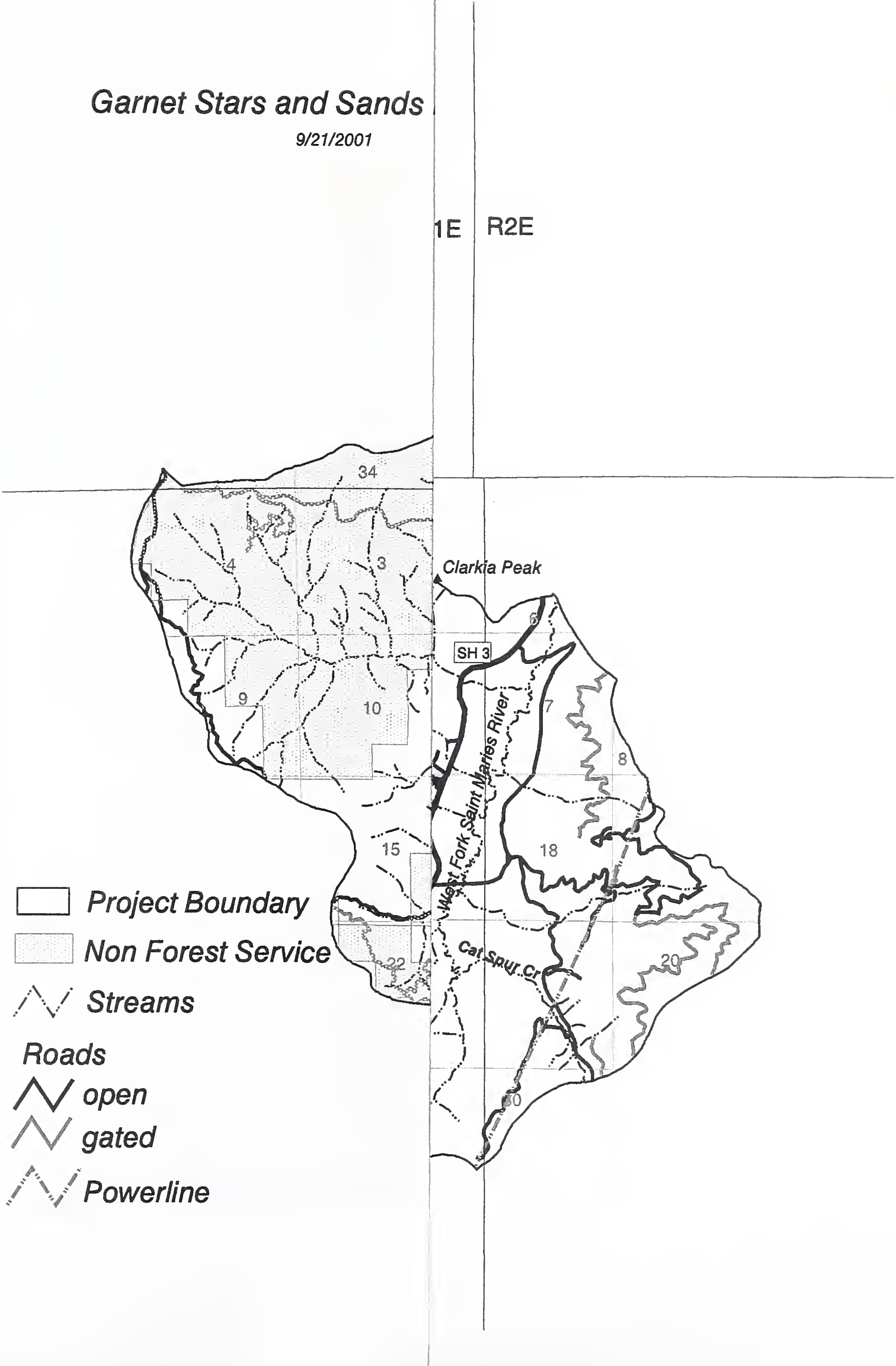
The scope of the effects analysis includes proposed activities and other activities that are ongoing or planned **within the project area**. One of these is the current Hidden Cedar Project. The proposed activities associated with Hidden Cedar were included in the cumulative effects analyses for pertinent resources. The Hidden Cedar project is not considered a "connected action" because the decisions in either of the projects would not affect or change the decision of the other. There are no other pending NEPA decisions within the project area.

The administrative scope of this document can be defined as the laws and regulations that provide the framework for the analysis.

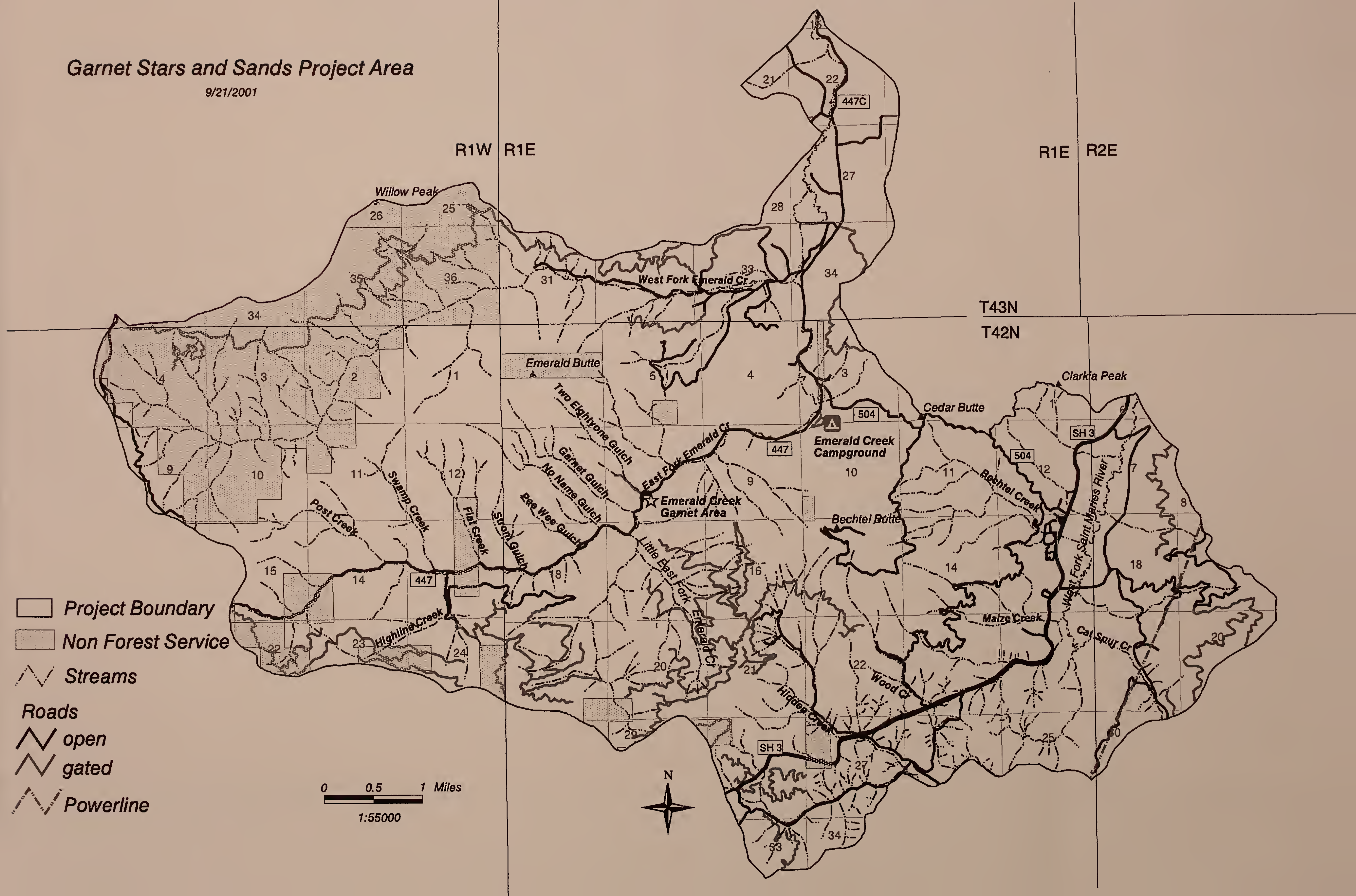
Decisions to be Made

1. Whether to test and develop future recreational garnet digging opportunities,
2. Whether to approve lease application

3. Whether to approve pending prospecting permits and extensions
4. Whether to renew existing leases
5. If prospecting permits and potential development are approved, what conditions and reclamation will be required.

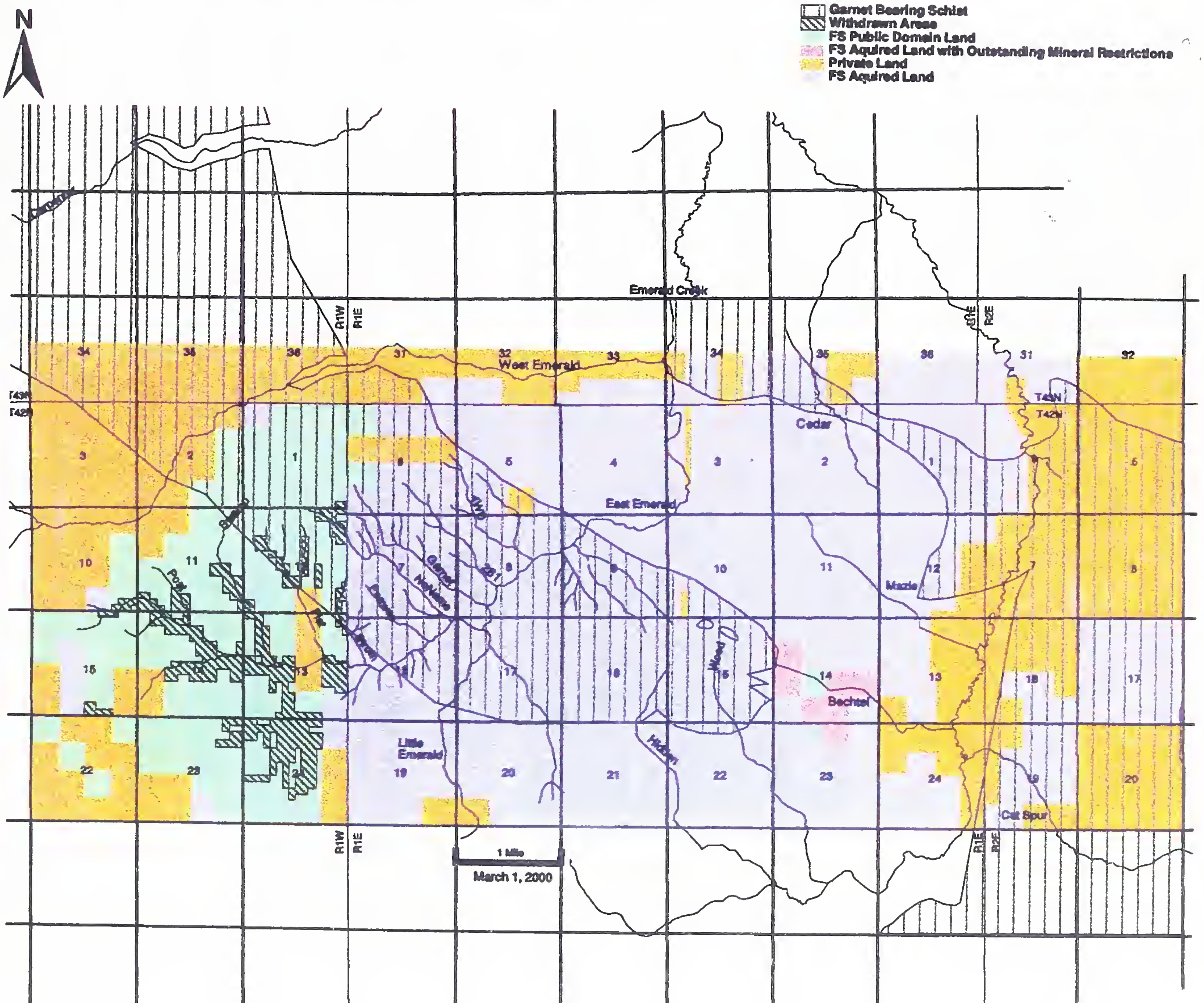


Garnet Stars and Sands
9/21/2001
1E
R2E
34
4
3
Clarkia Peak
SH 3
9
10
7
8
West Fork Saint Maries River
15
18
Cat Spur Cr
22
20
30
Project Boundary
Non Forest Service
Streams
Roads
open
gated
Powerline



Garnet Stars and Sands Project Area
9/21/2001
R1W
R1E
R1E
R2E
T43N
T42N
Willow Peak
Emerald Butte
Clarkia Peak
Cedar Butte
Bechtel Butte
West Fork Emerald Cr.
East Fork Emerald Cr
Little East Fork Emerald Cr
Two Eightyone Gulch
Garnet Gulch
No Name Gulch
Pee Wee Gulch
Strom Gulch
Flat Creek
Swamp Creek
Post Creek
Highline Creek
Hidden Creek
Wood Cr
Maize Creek
Bechtel Creek
Cat Spur Cr
West Fork Saint Maries River
Emerald Creek Campground
Emerald Creek Garnet Area
447C
504
447
SH 3
Project Boundary
Non Forest Service
Streams
Roads
open
gated
Powerline
0
0.5
1
Miles
1:55000
N

Overview of the Garnet-Bearing Schist and Land and Mineral Ownership



CHAPTER 2 – ALTERNATIVES

This chapter describes alternatives and their features. It describes the alternative development process which includes scoping and public involvement, issue identification, and development of alternatives. It gives detailed information about each alternative, then compares them. Alternatives that were considered but not given detailed study are discussed near the end of the chapter.

ALTERNATIVE DEVELOPMENT

Scoping

Public scoping for the Garnet Stars and Sands Project began in February 2001 when it was listed on the Quarterly Schedule of Proposed Actions. On February 18, 2001, a scoping notice was mailed to rock clubs, people interested in Emerald Creek Garnet Area, residents of Clarkia, Idaho (a nearby town) and known interested parties such as all prospecting and lease applicants, neighboring landowners, environmental groups, other government agencies and school teachers who are known to conduct garnet area field trips. The notice was also posted on the Idaho Panhandle National Forests web site. News releases were also sent to regional and local papers such as the *Spokesman–Review*, *St. Maries Gazette Record*, *Moscow-Pullman Daily News*, *Lewiston Morning Tribune* and *Shoshone News Press*. A Notice of Intent (NOI) to publish an Environmental Impact Statement was printed in the Federal Register on May 1, 2001. Both the scoping notice and NOI described the purpose and need and proposed action for this project. Forty responses were received.

Issues

Issues were identified based on public comments received, the knowledge and experience of the interdisciplinary team, and preliminary analysis of the proposed action. Three types of issues were identified: Alternative –driving issues, Concerns Addressed with Design Criteria and Mitigation Measures and issues outside the scope of the project analysis. Other issues and corresponding resources that were not considered key to alternative development are discussed in Chapter 3. Alternative Driving Issues are listed below. Concerns Addressed with Design Criteria and Mitigation Measures can be found on page 2-6. Effects on these resource concerns are described in Chapter 3. The remaining issues can be found in the project file (Issues Disposition Document).

Alternative-Driving Issues

Three key issues were developed from public comment and internal scoping.

Water Quality

The Environmental Protection Agency's 1994 list of Water Quality Limited Waterbodies (pursuant to Section 303 (d) of the Clean Water Act) includes some streams in the project area. The proposed action includes activities within tributaries of Emerald Creek and the West Fork of the St. Maries River. The main stem of Emerald Creek and the West Fork of St. Maries River are Water Quality Limited Segments (WQLS). Mining for garnets (recreational

or commercial) may have an effect on these tributaries. The WQLS are on the 303(d) list published by the State of Idaho, which also lists the pollutant(s) that have led to impairment of the assigned beneficial use.

The West Fork St. Maries River is listed as impaired by sediment and temperature modification. The main stem of Emerald Creek, below the confluence of the East and West Forks, is listed as impaired by sediment, habitat alteration and temperature modification.

The St. Maries River from Clarkia to Mashburn is listed as impaired by unknown pollutants. The St. Maries River below Mashburn to its confluence with the St. Joe River is listed as impaired by sediment, habitat alteration and nutrients. It is expected that the pollutants causing beneficial use impairment in the unknown category are similar to those listed for these other streams in the vicinity.

There should be no increase of pollutants that are causing impairment of beneficial uses from Forest Service proposals in WQLS streams.

Issue Indicator

The issue indicators for water are:

level of annual disturbed area
changes in water quality
Percent alteration of stream channel

Fish Habitat

Mining activities will affect project area streams that are listed in the Proposed Action (Chapter 1). For the streams in the project area, stream habitat degradation (loss of overwintering habitat) and impaired water quality (high summer water temperatures) presently plays the most important role in fish population regulation by influencing the carrying capacity and over-wintering survival (Sedell et al. 1988; McFadden 1969; Bjornn 1971).

Overwintering habitat is influenced by the condition of the riparian zone and by the condition of the streambanks. Large woody debris is a critical element for aquatic habitat diversity and complexity (Reeves et al. 1993). Overwintering habitat (pools) is often created by large woody debris, which also provides cover and adds complexity to habitats; this increases habitat suitability. Overwintering habitat is also influenced by condition of the streambanks. If streambanks erode excessively the increased input of sediment to the stream can cause the filling of pool habitat and the flattening of riffles (Gordon et al 1992). Erosion of streambanks affects the shape of the channel. The erosion of weak banks of gravel or other unconsolidated alluvium collapse easily, forming wide, shallow channels whereas banks of more cohesive materials form deep, narrow ones (Gordon et al 1992). The amount of riparian vegetation also influences the stability of the banks, the greater the density of the vegetation and the type of vegetation the more stable the banks.

Issue Indicators

Based on the fact that low carrying capacity and low overwintering survival are both limiting fish production in the project area, the issue indicators for fish are:

Percent disturbance of riparian zone
Increases or decreases in sediment
Percent alteration of stream channel

ALTERNATIVES CONSIDERED IN DETAIL

In addition to issue identification, the Interdisciplinary team considered the following elements while developing alternatives:

- Goals, objectives, standards and guidelines of the IPNF Forest Plan
- The affected environment as described in Chapter 3.
- Laws, regulations, policies that govern land use of National Forest lands.
- The purposes for which lands in the project area were acquired.
- The scientific findings of the Interior Columbia Basin Ecosystem Management Project

Alternative A – No Action

Recreational digging would continue in 281 Gulch until deposits are exhausted or the digging area reaches Forest Road (FR) 447, East Fork of Emerald Creek Road. At that time, the recreational digging would be discontinued. The leases/permit applications would be denied, i.e. there would be no mining in the area. The Reasonably Foreseeable Future Actions would include likely alternative in the Hidden Cedar EIS (DEIS June 2001), firewood cutting, berry picking and other dispersed recreation.

Alternative B – Proposed Action

Alternative B was designed specifically to meet the purpose and need described in Chapter 1 based on conditions within the project area. Map 1-1 on page 1-9 displays the project area associated with this alternative. The proposed action includes Design Criteria and Mitigation Measures listed starting on page 2-6.

1) Public Recreational Gemstone Digging Areas

The Forest Service would reserve Wood Creek and certain tributaries of the East Fork of Emerald Creek (281 Gulch, Garnet Gulch, No Name, PeeWee and Strom Creeks) for public recreational digging of gemstone garnets. These areas would not be available for commercial lease.

These drainages would be tested with a combination of auger holes (approximately 12 inches in diameter), hand (8 feet in diameter and 4 feet deep) or machine – dug (5-15 feet deep, 5 feet wide and 15 feet long at intervals of at least 100 feet apart) trenches. It is estimated that each drainage could potentially require 60 test sites in some combination of auger holes, hand –dug pits and machine trenches. After testing, drainages will be listed in order of priority for development. The drainage with the best opportunities and cost effectiveness would be developed after operations in 281 Gulch ceased. Different development would be required within each drainage. The mitigations and design features outlined in Chapter 2 would be adhered to.

Details By Drainage

281 Gulch: Progressive digging would continue in the two forks to the confluence of the East and West Forks. Digging would then continue on the main fork of 281 Gulch to Road 447. Overburden removal would be needed.

Garnet Gulch: The original parking area for Pee Wee and No Name creeks would be used for this drainage. The a-frame would be located at the parking area and a toilet facility installed. An estimated ½ mile trail would be constructed. Some overburden removal may be necessary.

PeeWee and No Name Creeks: These drainages have been recreational digging areas previously and are known to have high quality gemstones. Gem collecting in the past was done primarily with hand digging and it is believed that there may be more resource available if overburden can be removed. Development would include a toilet facility but the parking and other site space still exist. These two areas shared parking areas. Overburden removal is likely going to be necessary.

Strom Gulch: Only testing at this time will be completed within this drainage. Further development is not foreseen within the next ten years.

Wood Creek: Parking and a site for the a-frame and toilet would be developed. Some overburden removal may be necessary.

2) Lease Application

The pending lease application (ID 29529) for gemstones on Bechtel Butte would be approved. This entails the following: 5 to 6 pits 15 feet in diameter; one backhoe trench 100 feet long by 20 feet wide and 8 feet deep on the ridge; a bobcat excavator wouid be used to fill in and dig smaller trenches (T42N, R1E, Sections 9, 10, 15 and 16). It is expected that these activities would begin in 2002 and continue through 2007.

3) Prospecting Permits

Prospecting permits authorize exploration, which could lead to further development applied for in the form of a lease application. To perform an efficient analysis **for some of the permits where we have substantial information,** we are analyzing possible subsequent development as long as analysis shows that it can be done within relevant laws and regulations. When or if a lease application is filed, then another NEPA decision would be required but it is likely that much of the pre-work would be complete with this document.

The following pending prospecting permit applications (ID 31439, 31440, 31441, 31442, 31443, 31444) and prospecting permit extension (ID 29619) would be approved. Specifically this entails five backhoe trenches.

For the area under these permits, ID 31439-31444 and 29619, the following subsequent development is analyzed:

Mining of garnet sands on National Forest lands along the East and West Forks of Emerald Creek would be proposed later and would require another NEPA analysis and decision. These activities are predicted at this time and would likely include the wider and more

accessible portions of the East Fork from the west line of T42N, R1E, Section 18 (between Flat Creek and Strom Gulch, approximately 10,000 feet) to near the confluence of the East and West Forks of Emerald Creek. Some portions of Road 447 may be temporarily rerouted around mining operations and replaced afterward. Some portions of the creek channel would be temporarily relocated for mining and then rebuilt. A similar mining scenario would take place in the West Fork on approximately 25 acres (½ mile of stream). The West Fork operations would begin at the upstream end and take two summer seasons beginning in the year 2003. The total East Fork operations would begin at the upstream end of the creek and would last for 7 to 10 summer seasons starting in the year 2003 (Pers. Communication, S. Osborne, Emerald Creek Garnet Co.). West Fork location: T43N, R1E, Section 33 and T42N, R1E, Section 4. East Fork locations: T42N, R1W, Sections 13 and 14; T42N, R1E, Sections 3,8,9,17, and 18.

Other areas would be explored for possible future mining development of garnet sands. However, the probability of mining activity here is less certain and will not be analyzed at this time. Any development of these other drainages would likely be applied for after the mining in the East and West Forks is complete.

The pending prospecting permit application (ID 33036/ amended application (4/2/2001)) for garnet gemstones would be approved. This entails hand-dug trenches in a tributary to Cat Spur Creek. No assumptions for further development will be made at this time. (T42N, R2E, Section 19)

The pending prospecting permit application (ID 32421) for garnet sands on Bechtel Butte would be approved. This entails three hand-dug trenches 10 ft x 12 ft. No assumptions for further development will be made at this time. (T42N, R1E, Sections 9, 10, 15, 16).

4) Lease Renewal

The pending lease renewal applications (ID 016415 and 25554) would be approved. There is planned development and mining for garnet sands on approximately 8.0 acres in Section 9 on the East Fork of Emerald Creek; these operations would likely occur in the last third of the 7-10 year mining period for mining the East Fork. The Plan of Operations would require another NEPA decision. Remaining areas of the lease have already been mined and reclaimed (T42N, R1E, Section 9).

5) Conditions and Reclamation

The conditions and reclamation requirements under which any recreational and commercial garnet mining could be implemented are developed and presented in Chapter 2 of this EIS.

6) Forest Plan Amendments and Other Agency Permits

The garnet resource in Emerald Creek and related Forest Plan standards supporting its development were not considered in the INFISH Amendment to the Idaho Panhandle Forest Plan (1995). Consequently, the Forest Service is in the process of determining the intent of the INFISH standards as they apply to operations such as these on acquired lands. It is possible that a non-significant, site-specific Forest Plan amendment would be required.

It is possible that this proposal would require a non-significant, site-specific Forest Plan amendment regarding mining development if some areas are restricted from development.

For Alternatives B and C there are six drainages that would not be available for commercial lease. For Alternative A, none of the area would be available for commercial lease. More alternatives could be developed between the Draft and Final EIS. Dependent on which alternative is selected after the Final EIS, an amendment to the Forest Plan may be needed.

The proposed action allows for commercial leasing of gemstones and sands, which requires permit approval and implementation by the Bureau of Land Management. Project implementation for both recreational digging and commercial development within floodplains would require Corps of Engineers Permits (404 permits) and State of Idaho permits.

Alternative C

Two key issues, possible effects on water quality and fish habitat from mining activities, led to the development of Alternative C.

This Alternative is the same as Alternative B, except it imposes a 30-foot stream buffer along the East and West Forks of Emerald Creek for the potential commercial sand mining. This means that potential commercial sand mining by Emerald Creek Garnet Company (ECGC) would not disturb the stream or stream bank for 30 feet each side of the stream. This buffer would further protect stream bank stability and some of the riparian habitat. A similar garnet sand mining operation by ECGC was completed in 1990 at “Shorty’s Dig” on National Forest land. The District hydrologist monitored sediment during and after these activities and found no sediment increase with the use of this buffer (Hallisey,1994, Project Files). This restriction was not included for the recreational digging. Please see the section Alternatives Considered but Dropped from Further Study for more information. Alternative C also incorporates the Design Features and Mitigation Measures listed below.

There would be testing and development of recreational garnet digging in Wood and Emerald Creek drainages.

There would be approval of the lease application for garnet gemstones on Bechtel Butte.

There would be approval of prospecting permits and extensions for garnet sands in the East and West Forks of Emerald Creek, for garnet gemstones in a tributary to Catspur Creek and garnet sands on Bechtel Butte.

There would be approval of lease renewal for garnet sands in the East Fork of Emerald Creek.

DESIGN CRITERIA AND MITIGATION MEASURES

Design Criteria

All action alternatives will utilize applicable Best Management Practices identified in relevant provisions of the Surface Mining and Dredge and Placer Operations (State of Idaho Department of Lands – Bureau of Minerals, “Manual of Best Management Practices for the Mining Industry in Idaho, 1992) listed in Appendix B of this document. In addition, the following measures will also be adhered to for the action alternatives. Where these criteria may overlap with the State of Idaho BMPs, these project -specific criteria will supersede the State of Idaho provisions.

Operational and Mitigation Measures

General

Existing roads would be used for motor vehicle access; no new road construction would occur.

For recreational digging, only one drainage at a time would be opened for public collecting.

For recreational digging, approximately 1 mile of each stream except Wood Creek is assumed to be suitable for gemstone digging. For Wood Creek, it is assumed to be 1.5 miles.

Approximately 200- 300 feet of digging area per year is the maximum for the recreational collecting area.

No exemption to the 14- day camping limit will be granted to entities requesting prospecting permits or leases.

No hazardous material storage on –site and emergency spill equipment should be kept on hand where any equipment is operating.

It is estimated that each drainage for recreational gemstone testing could potentially require 60 test sites in some combination of auger holes, hand –dug pits and machine trenches. The hydrologist recommends no more than 20 of the machine –dug trenches for each drainage.

Air Quality

This project would comply with procedural and substantive requirements of the Clean Air Act, State Implementation Plans and State Smoke Management Plans. Dust abatement would be applied on Road 447 in conjunction with commercial sand mining on the East and West Forks of Emerald Creek,

Fish

Commercial and recreational operations in riparian areas would occur between May 1 and September 30 if there is not stream channel disturbance. If there is stream channel disturbance and it is a fish –bearing stream, the season would be from July 1 to September 30 of each year.

For both commercial mining and recreational digging, any trees that are cut would be left on site and possibly used for reclamation.

Culverts will be replaced where mining operations are within areas with culverts that are undersized. These culverts are located in NoName Gulch and PeeWee Gulch. See the Fisheries Section in Chapter 3.

Heritage Resources

Heritage resources would be protected; specifically the railroad trestles and splash dams in the East Fork of Emerald Creek would have buffers. These buffers would be designed when

or if a lease application and plan of operations is submitted after explorative testing. If there were discovery of a new Cultural Resource site, the lease holder or permittee or in the case of recreational digging, a Forest Service employee would be required to stop activities and report the find. The Forest Service would inventory the site and develop mitigations in consultation with the State Historic Preservation Officer and, if necessary, the Advisory Council on Historic Preservation and appropriate Native American tribes to protect the site.

The exploratory area at Bechtel Creek will be surveyed for cultural resources before these activities are implemented. Any sites found will be inventoried and avoided in accordance with the National Historic Preservation Act.

Minerals

Potential commercial garnet sand mining will leave gemstone garnets in place (gemstone size garnets are considered to be 7/16 inches or larger)

Plants / Noxious Weeds

Field surveys for “Plant Species at Risk” will be conducted where necessary, prior to project activities, to verify or negate presence. Measures to protect population viability and habitat for all know and newly discovered occurrences would include the following: altering or dropping proposed areas from activity, modifying the proposed activity and /or implementing buffers around plant occurrences.

Noxious Weeds

A number of preventative measures will be taken to reduce the risk of noxious weed introduction and spread in accordance with the St. Joe Weed EIS (ROD, 10/12/99) Measures include:

Mulching agents such as hay or straw will be certified noxious weed seed -free before being allowed on the project area.

All seed used for re-vegetation and erosion control purposes would be certified noxious weed-free.

Off-road mining equipment would be cleaned and inspected before moving onto the site.

Soils and Watershed

Permanent structures, in this case toilets, will be permitted in flood plains only if no other locations are available.

Test pits for prospecting and testing: There will be no pits in wetland areas and no testing closer than 10 feet to the streams. There will be no tree removal unless absolutely necessary. In particular, no stream shading trees will be cut. If a tree must be felled, it will remain in place and not be removed. Test holes on prospecting permits and the recreational dig sites would be filled in immediately, have existing vegetation replaced, be seeded with mixes including native vegetation and be mulched. Hand –dug pits and machine –dug trenches will include stockpiling the topsoil and replacing it, retaining native vegetation where

possible and seeding and mulching. Each trench or pit will be reclaimed prior to digging another trench.

Wetland areas that are disturbed or destroyed by gemstone or sand extraction must be restored or replaced in kind elsewhere in the same drainage.

Overburden removal: This removal should be kept to a minimum and topsoil will be kept in a separate pile to return to the site. The overburden and topsoil stockpiles will have erosion control measures in place such as mulching, covering with erosion control matting, installing straw bales or other methods to prevent surface erosion and sediment transport.

Channel restoration: where disturbance to the stream channel occurs, rehabilitation will incorporate large woody material, boulders, shrub and tree planting, sedge transplanting and channel design as directed by the hydrologist and/or fish biologist.

Sediment basins: install sediment basins or settling ponds to collect sediment generated from the gemstone or sand extraction, use straw bales or a silt fence at the outlet to handle water filtration. For the recreational digging, remove sediment from settling basins and place material as far from the active channel as practicable, mulch with straw and scatter native seed over fresh deposits.

Remove excess sediment from settling ponds at downstream locations with a backpack or small suction dredge.

Wildlife

For Forest Service testing and other prospecting permit exploration: If or when use of a restricted road is necessary, this will be approved by the wildlife biologist and the gate /barrier will be left in a fully functioning condition after each exit on gated roads and at the end of the day on barriered roads. There will be no use of restricted roads past September 1.

For the recreational digging, if vegetative /overburden removal exceeds 300 feet in width for more than 300 feet of stream length, 4 snags /acre (>20 inches dbh and 20 feet in height) will be installed during yearly rehabilitation.

For the lease operations on Bechtel Butte, pits that are left open will be fenced to keep wildlife from falling in (deer and elk). Means of escape for other wildlife will be provided in each pit (e.g. log from bottom to edge).

All operations will not cause an increase in motorized access by road or trail construction.

All test, prospecting and lease application pit locations will be approved by Forest Service prior to digging and located to limit falling of trees.

For potential commercial sand mining in the East of West Forks of Emerald Creek, measures to prevent expansion of existing cattle grazing will be considered and implemented if feasible. Details will be worked out if and when a lease application and plan of operations is submitted.

Reclamation Plan

Reclamation will follow Best Management Practices recommended by the State of Idaho that are relevant to this project. These are listed in Appendix B.

The recreation sites rehabilitation will be implemented at the end of each season. The permitees and leaseholders will be required to do site reclamation concurrently as each area / site is completed.

Re-vegetate using native vegetation from the site – as much as possible- maintain the existing or historic vegetative composition. This includes trees, shrubs, and forbs.

A mix of native and non-native annual grasses (potential forage) will be used in rehabilitation of sites. The non-native annual grasses are very valuable in revegetating the sites quickly to avoid erosion.

Return the topography to present slope and elevation. Maintain the existing (or increase) the amount of persistent pooled water (for amphibian habitat).

For potential commercial mining of sands, develop a vegetation management plan to maintain habitat quality and monitor vegetative survival for 5 years.

Overburden will be excavated in soil layers and stockpiled to return to pre-existing condition. See above under operations, soil /water for more detail.

There would be an approved Reclamation Plan and Bonding required before any activity.

Monitoring

Monitoring is conducted on a sample basis and is designed to verify that the projects are implemented as designed, are effective and most efficient in meeting the project and Forest Plan objectives, and determine whether the project and Forest Plan goals and objectives for the area are still appropriate. Those monitoring components not specifically discussed tier to the monitoring described in the Forest Plan. The Idaho Panhandle National Forest annually conducts a review of BMP implementation and effectiveness. The results of this and other monitoring are summarized in an Annual Monitoring and Evaluation Report. The report provides information about how well the management direction of the Forest Plan is being carried out and measures the accomplishment of anticipated outputs, activities and effects.

Forest Plan Monitoring

The Idaho Panhandle National Forests have developed a plan to monitor Forest Plan implementation, monitor the effectiveness of management practices implemented under the Forest Plan, and validate the assumptions and models used in planning. The Forest prepares a Forest Plan Monitoring and Evaluation Report on an annual basis to document the results of this monitoring. The latest one is for the Year 2000.

Forest level monitoring may or may not take place specifically on the projects, but information gathered and lessons learned at the broader level are applied back to specific project level design, implementation, and monitoring. Forest Plan monitoring for the St. Joe District which address issues pertinent the Garnet Stars and Sands Project area include:

- Heritage Resources - Field monitoring is done by Ranger Districts to measure potential effects of land disturbing projects on known cultural resources. Areas are surveyed prior to project implementation, and site specific plans are developed to protect newly identified sites.

- Plants, Threatened, Endangered, and Sensitive - IPNF direction is to inventory and manage sensitive plants so that no new species have to be listed as threatened or endangered. Project areas are surveyed and projects are modified before ground – disturbing activities begin to attain this objective. Sensitive plants are protected according to site specific management plans.

Soils - IPNF objective is that management activities on Forest lands will not significantly impair the long-term productivity of the soil or produce unacceptable levels of sedimentation resulting from soil erosion. This will be accomplished using technical guides developed in conjunction with the soil survey and Best Management Practices necessary to protect soil productivity and minimize sedimentation.

- Visual Quality - Decision documents are reviewed annually for Forest Plan visual quality objective compliance. Annually, up to two areas per district may be field reviewed after harvesting has been completed. The objective of the field review is to determine if the (Visual Quality Objectives) VQOs have been met as disclosed by the decision document for that sale. A ten percent departure from Forest Plan direction after five years would initiate further evaluation of the visual resource management program.

- Water Quality - Forest Plan Appendix JJ established the IPNF water quality monitoring program. The water quality monitoring program is the result of a Memorandum of Understanding with the State of Idaho dated September 19, 1988. The agreement also replaced Forest Plan Appendix S (Best Management Practices) with Forest Service Handbook 2509.22 (Soil and Water Conservation Practice Handbook).

    According to Appendix JJ of the Forest Plan, in order to demonstrate water quality protection, monitoring plans would address three primary questions:

    -Are BMPs implemented as designed? -Are the BMPs effective in controlling non-point sources of pollution? -Are beneficial uses of water protected?

    To provide answers to these questions, the following monitoring categories would be utilized:

    Baseline monitoring characterizes existing water quality conditions and long-term trends of stream systems. It also provides a control for monitoring and assessing activities. Baseline monitoring sites throughout the Forest have been identified and established to representatively sample conditions on the Forest.

    Implementation monitoring shows whether or not prescribed BMPs were implemented as designed and in accordance with Forest/Project Plan standards and guidelines. In addition to specific project monitoring discussed in this document, supplemental implementation monitoring would include internal field reviews by interdisciplinary teams using a procedure similar to State audits.

    Specific projects to be monitored would be selected based on local issues and BMPs used. Projects involving each type of land management activity and a target of 10 percent of timber sales would be evaluated per year. The primary objective would be to determine if BMPs identified in the Forest/Project plan were implemented and correctly applied in a timely fashion. During the review, visual observations would be made to see if BMPs and Forest/Project plan standards and guidelines are effective.

In the event of incorrect or inappropriate application of BMPs, or omission of prescribed BMPs, causes would be identified along with corrective or preventive actions to be taken. Corrective measures would be incorporated into: 1) modification of and adjustment to contracts; 2) administrative procedures; and 3) long range plans as necessary to ensure BMPs are both properly designed and implemented.

Effectiveness monitoring demonstrates if BMPs were effective in controlling pollutants to meet planned levels or resource management objectives. The intent is to focus on cause and effect relationships between land management activities and water quality. Effectiveness monitoring would be done on a sample basis to characterize typical conditions so that results can be extrapolated. Emphasis would be on major non-point pollution source contributing activities such as road construction, reconstruction, and maintenance; related erosion control BMPs; and riparian area management.

- Wildlife - Big game management indicator species population trends are determined by the Idaho Department of Fish and Game. Hunter success rates and visual counts of animals are used to determine these population levels.

  Elk Habitat Potentials are monitored district-wide and by individual Elk Habitat Unit annually.

  Northern goshawk nesting sites are being monitored District wide. Known nesting sites are being visually inspected to determine occupancy. The monitoring frequency varies based on funding. Surveys are conducted for additional nesting sites during project planning or implementation if nests are sighted.

Project Monitoring

In addition to Forest Plan monitoring, monitoring is conducted on specific projects to ensure that implementation is consistent with the established standards and guidelines. Monitoring is also conducted to determine the effectiveness of management activities and applied mitigation measures. Specific monitoring developed for the project includes:

Baseline Monitoring

Stream surveys conducted in the project area established a baseline for monitoring channel equilibrium and erosion sites, as well as fisheries habitat conditions.

Implementation Monitoring

Project implementation generally involves the efforts of a variety of individuals with both specialized and general skills and training. For the potential minerals prospecting permits and or leases on acquired lands, the Bureau of Land Management conducts regular checks on operations. Bonding is required to ensure that reclamation is done as proposed. The Bureau of Land Management works with the Forest Service to ensure that operations go as planned. Employees on the St. Joe District are accustomed to working together to achieve the desired project objectives. For example, the minerals administrator works with biologists or other specialists to ensure that commercial operations and reclamation are implemented properly. With the recreational digging sites, the recreation specialist continually works with the hydrologist and fish biologist to ensure

that the ongoing operations and end reclamation product is as planned. Joint field reviews are taken as needed. These steady informal communications allow for incremental project adjustment throughout implementation to achieve the desired results. In addition to these less formal monitoring procedures, the following monitoring items would be conducted.

- Heritage Resources – Special buffers are provided to protect all existing recorded cultural resources. All operators of commercial mining are required to promptly notify the Forest Service upon discovery of a previously unidentified cultural resource.
  - Water Quality – For commercial mining on acquired lands (leasing) the Bureau of Land Management and the Forest Service monitor operations and reclamation. The implementation of applicable BMPs and mitigation measures (site specific BMPs) are ensured. Monitoring would be documented in inspection reports. Copies of the reports are given to the Forest Service and the completed reports for BMPs are given to the forest hydrologist, who forwards them to the State Bureau of Water Quality on an annual basis.

Effectiveness Monitoring

- Water Quality - BMP effectiveness would be conducted semi-annually as long as mining operations are going on. Monitoring would be done following at least one runoff season after BMP implementation. Semi- annual inspections of sediment basins, operations and past rehabilitation will be conducted. If and when a lease application and plan of operations are submitted, the potential commercial sand mining operations will include monitoring stream sediment and turbidity. Deficiencies will be corrected and new practices implemented as necessary. Further monitoring would be correlated with watershed exams on the project area through the 5th year after project implementation based on available funding.
- ·Noxious Weeds – The commercial operations would be required to monitor new weed populations. Forest Service employees monitor the recreational digging areas for new populations of noxious weeds. Areas where ground-disturbing activities have occurred will be inspected at least yearly for new populations of noxious weeds. Should new populations be found, treatment will be implemented in accordance with priorities set by the noxious weed program.
- Vegetative Success: All revegetated areas for recreational and commercial operations will be monitored at least yearly to ensure the success of regeneration. Additional applications of seed or planting of shrubs may be recommended.

ALTERNATIVES CONSIDERED BUT NOT STUDIED IN DETAIL

Range Of Alternatives

Section 102(2)(e) of the National Environmental Policy Act (NEPA) states that all Federal agencies shall "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources."

An Environmental Assessment must also “rigorously explore and objectively evaluate all reasonable alternatives” [40 CFR 1502.14(a)].

The courts have established that this direction does not mean that every conceivable alternative must be considered, but that selection and discussion of alternatives must permit a reasoned choice and foster informed decision making and informed public participation.

The range of alternatives presented in this chapter was determined by evaluating public and internal comments and the Purpose and Need for the project. Other influences included Forest Plan goals, objectives, desired future condition, and standards and guidelines; federal laws, regulations, and policies. Within these parameters, the alternatives developed by the ID team display a reasonable range of outputs, management requirements, mitigation measures, and effects on resources. In addition to the alternatives considered in detail, the ID team examined a number of other alternatives during the analysis process. Although these alternatives contributed to the reasonable range, they were eliminated from further consideration for the reasons listed below.

Strom Gulch development: The potential development in Strom Creek for recreational digging will not be analyzed in this EIS. The recreation specialist and transportation specialist reviewed the potential digging area. After much discussion and field work, it was determined that there are a number of reasons why this would not be developed in the reasonably foreseeable future. First of all, it is the most unlikely stream to test for gemstone garnets in quantities necessary for a recreational dig; evidence within these drainages shows up by observing small digging areas which were dug in the past when these areas were not restricted. Secondly, the access for the public is more difficult and expensive than other drainages that have more promise for gemstone garnet. There is an upper road (FR 1487) that can be used for access but it would require opening a gated area, excavating a larger area for parking and building a 4000- foot trail down to the digging area. As for the lower road (FR 447), there is no parking area available close to the Gulch. The closest space would be the existing PeeWee parking lot and this is 4000 feet downstream along FR447. (Project Files, IDT meeting notes on 7/12/2001)

Implementing 30 foot No Disturbance Buffers for the Recreational Digging: This is the restriction that is listed with Alternative C for the potential commercial garnet sand mining in the East and West Forks of Emerald Creek. Implementing these buffers for the recreational digging would effectively close it down. The star gemstones are within the stream buffer of 30 feet in narrow valleys of the six potential development areas (281, Garnet Gulch, PeeWee, NoName, Strom and Wood Creeks).

Allow unregulated garnet digging: The recreational garnet fee digging area provided by the Forest Service is expensive to operate. There was a suggestion to just allow unregulated garnet digging. At one time in the past, this is exactly what was happening in Emerald Creek. Environmental damage was found to be unacceptable, sanitary conditions were called “a deplorable mess” and activities were often unsafe (undercutting banks, using explosives, etc.). Law enforcement surveillance would have to be increased. More detail is included in the Recreation and Minerals sections of Chapter 3.

Alternative to design a new stream channel for the East Fork of Emerald Creek using the 1930 photos showing stream sinuosity etc: The stream channel was altered before 1930 so these photos would not be entirely accurate. In addition, Alternatives B and C could

include reclamation in the final plan of operations for commercial sand mining that would design the end result that is desired.

Alternative with no commercial gemstone removal, i.e. save all gem and star garnet deposits for future generations of recreational diggers: Since most of the lands within the project area are on "acquired" lands, approval of mining operations is discretionary. Future prospecting permits and/or lease applications can be denied if there are reasons to do so. Alternatives B and C are both reserving six drainages for future garnet seekers. If these drainages were developed 200-300 feet per year, the public digging could potentially last from 50-75 years. The two gemstone minerals applications, a permit in a tributary to Catspur Creek and a lease application on Bechtel Butte, are in two additional areas known to have garnet gemstones. Reserving six areas for public collecting is believed to adequately meet the public's interest.

COMPARISON OF ALTERNATIVES

This section compares the alternatives. This is, by no means, a complete picture of how the alternatives compare to each other; much more information is available in Chapter 3 of the DEIS.

Table 2-1 - Meeting the Purpose and Need

Purpose and Need	Alt A	Alt B	Alt C
1. Respond to public interest in developing the garnet mineral resource	No	Yes	Yes
2. Identify, test and develop other areas for the Forest Service to provide the unique recreational digging opportunity.	No	Yes	Yes
3. Resolve twelve pending mining applications or extensions.	Yes	Yes	Yes

Addressing the Issues

Table 2-2 – Alternative Driving issue - Water Quality

Issue Indicator	Alt A	Alt B	Alt C
level of annual disturbed area (acres)	0.29	0.47**	0.47
changes in water quality	N	N*	N*

*Water quality is assuming suction dredging to remove introduced sediment; see Design Features

**Alternative B is considered to increase sediment in downstream reaches with the potential commercial sand mining in the East and West Forks of Emerald Creeks. This can only be estimated at this time and is not quantified.

Table 2-3 – Alternative Driving Issue - Fish Habitat

In the table below, Disturbance to Riparian Zone, identifies the percentage of the riparian zone within the drainage which will be impacted. Increase in sediment indicates whether the implementation of the project will increase sediment to the stream channel (Y=Yes, N=No). Alteration of Stream Channel indicates the percentage of fish habitat which would be affected if the alternative were implemented. This information identifies the short-term disturbance.

Stream Name	Issue Indicator	Alt A	Alt B	Alt C
East Fork Emerald includes Potential development)	Disturbance to Riparian Zone	0	2%	2%
	Increase in Sediment	N	Y	Y
	Alteration of Stream channel	0	22%	0
No Name Gulch	Disturbance to Riparian Zone	0	37%	37%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Pee Wee Gulch	Disturbance to Riparian Zone	0	100%	100%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
281 Gulch	Disturbance to Riparian Zone	0	50%	50%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Strom Gulch	Disturbance to Riparian Zone	0	68%	68%
	Increase in Sediment	N	Y	Y
	Alteration of Stream channel	0	0	0
Garnet Gulch	Disturbance to Riparian Zone	0	37%	37%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Tributary to the West Fork of Emerald (includes Potential development)	Disturbance to Riparian Zone	0	22%	22%
	Increase in Sediment	N	Y	Y
	Alteration of Stream channel	0	0	0
Wood Creek	Disturbance to Riparian Zone	0	20%	20%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	56%	56%
Cat Spur Creek	Disturbance to Riparian Zone	0	1%	1%
	Increase in Sediment	N	N	N
	Alteration of Stream channel	0	1%	1%

1) it is assumed that unregulated mining would increase in these drainages which would cause an increase in sediment

2) it is assumed that unregulated mining would occur in these drainages but it is unknown to what extent the channels would be altered

Resource Analysis Issues

Air Quality

The air quality of the Project Area is generally considered good. There are no effects on air quality from Alternative A, No Action. For the action alternatives, test digging and activities would create vehicle exhaust and dust. Impacts would be limited to the area directly adjacent

to and during activity and for the few minutes it takes following the activity for dust to settle and exhaust to dissipate. All alternatives are consistent with Forest Plan standards for air quality.

Fisheries

Alternative A should have the least amount of impact to the fisheries resource, because no additional disturbance would be occurring. This is accurate for the garnet sands mining but it is not completely accurate for the gemstone mining operation. This is due to the assumption that after the garnet gemstone mining in 281 Gulch is depleted and no other Forest Service managed operations are initiated, it is highly probable that unregulated mining would occur. If unregulated mining is not curtailed then it would have all of the detrimental effects discussed in Chapter 3, but unlike the mining which is operated by the Forest Service, unregulated mining would have none of the rehabilitation efforts which minimize the negative effects. Please see the Recreation and Minerals sections below for details.

Alternative B is the most impactive to the fisheries of the three alternatives if the potential development of garnet sand mining is considered. The instream fish habitat of one of the East Fork tributaries would be altered through the recreational mining for gemstones. The potential development for commercial garnet sands could occur after testing and a lease application and plan of operations are submitted (requiring another NEPA decision). The potential garnet sand mining would completely alter instream fish habitat of both East Fork Emerald (sand extraction). Although the mining company has shown that their rehabilitation efforts are an improvement over unrehabiltated lands there is still an unspecified amount of time that it will take the stream to return to at least the same quality of habitat as prior to the relocation. This same statement is true for the recreational mining on Forest Service lands although as mentioned for Alternative A the potential for unregulated mining could cause even greater problems. The long term development of the area would eventually create disturbance of all four spawning/early rearing streams within the project area.

Alternative C is the least impactive of the alternatives if the potential for unregulated mining could not be eliminated. It allows garnet gemstone mining, which should minimize the amount of unregulated mining and the Forest Service managed operation will rehabilitate the area which should reduce the impacts to the fishery. The long term development of the area would however, eventually create disturbance of all four spawning/early rearing streams within the project area. The effects to East Fork of Emerald are also the least impactive under this alternative because of the establishment of a 30 foot buffer and the retention of the stream channel in its current location for the potential garnet sand mining.

All other aspects of this project, Forest Service test exploration, prospecting permits and lease application, would have similar results between all alternatives.

The primary activities proposed in this EIS that could affect fish are the recreational mining and the potential garnet sand mining that could be applied for after testing is complete. There are 6 general standards in the IPNF Forest Plan including the additional standards of INFish, which are applicable to the fisheries resource (IPNF Forest Plan, II-29-31, INFish). An Interagency Implementation Team reviewed the Emerald Creek Recreational Dig in September 1999 to determine if it was in compliance with INFish (project file document titled "USDI BLM, Oct 26, 1999). That report stated that the mining did not appear to be in compliance with INFish and that there was a need to minimize the impact of the activity. It

also identified the need for annual rehabilitation of the site to accommodate the spring/winter runoff. Annual rehabilitation is currently being done at this site.

The design criteria developed for this project are anticipated to address these concerns. It is acknowledge that fish habitat conditions are expected to be adversely impacted by effects to the streams in which recreational garnet mining will occur, however the regulation of the activity and the design criteria developed for the project should help to minimize impacts to the aquatic resources and thereby address InFish standard MM-1. The review went on to comment that a watershed assessment should be conducted to identify trade-offs, which may need to be made. Compliance with MM-2 will be met because there will be no new support facilities constructed in the RHCA, existing parking areas will be used. Compliance with MM-3 will be met because there is no potential for increased chemical contamination from this project, and various design criteria have been developed to reclaim and monitor the tailings from the mining activity. MM- 5 will be met because the decision associated to this project in regards to sand extraction, relates solely to the digging of test trenches. The test trenches will not retard or prevent attainment of RMO's.

If subsequent mining of the sands, identified in this document as "potential development" should occur, a separate NEPA document will be developed to consider that activity. The possible conflict between standards in the Forest Plan that apply to this activity should be resolved prior to the initiation of that separate NEPA document. MM-6 will be met based on the development of monitoring plan identified in this Chapter.

Heritage Resources

Heritage resources include buildings, sites, area and objects having scientific, historic or social values. They comprise an irreplaceable resource relating past human life. The activity areas have been inventoried and proposed activities would have no impact on these resources. For the sites that are likely within the potential commercial sand mining activity areas in the East Fork of Emerald Creek, mitigations would be developed to protect specific heritage sites when the lease application and plan of operations are submitted.

The paleontological site is not within potential activity areas.

The potential does exist for finding additional sites during project implementation. If additional sites are discovered, the sites would be inventoried and then protected if found to be of cultural significance. The decision to avoid, protect or mitigate impacts to these sites would be in accordance with the National Historic Preservation Act. For the most part, site – avoidance would be the method to protect heritage resources; therefore there are no expected direct, indirect or cumulative effects to the heritage resources with implementation of the action alternatives.

Systematic inventory and reports are complete for this project area and Native American groups have been given the opportunity to comment. All alternatives comply with the National Historic Preservation Act and the IPNF Forest Plan.

Minerals and Geology

Implementing Alternative A would have a negative effect on the world supply of industrial garnet considering that ECGC supplies between 15% and 20% of the world industrial garnet

supply off of private, State, and National Forest lands (personal communication – Mike Zientek, USGS – 5/9/2001). Although exact reserve estimates for all of the National Forest lands in the project area are not available, these reserves easily represent the major un-mined portion of the best quality industrial garnets in the deposit. This resource would essential be off -limits under Alternative A.

Alternative A would also close down the recreational gem collecting in Emerald Creek Garnet Area. Unauthorized digging would again occur; more law enforcement would be necessary. Environmental damage from unmanaged digging would occur. There is an enormous amount of public support that has been demonstrated over the years. Please refer back to the section titled “Collecting of Garnets” in this Mineral Section for the history and the Recreation Section for effects analysis.

Alternative A would also have a negative effect on the future of the commercial garnet mining industry and thus the local economy in the area. The loss of 50-60 high –paying jobs would have a significant effect on the local economy. Denial of the other permits or lease applications outside of ECGC’s permits would affect these people individually. Other peripheral effects in the economy would be noticed; please see the Recreation Section for further detail.

Alternatives B and C reserve 6 drainages for gem garnet collecting for future public collecting areas. A Forest Plan amendment would be required for the “no-lease” portion of these areas. The exclusion of these areas from leasing would have a minor negative effect on the overall reserves for industrial garnet sands and a negative effect on future gem garnet leasing. These areas comprise some of the best-known reserves of gem garnets in the area. However, other portions of the project area contain gem garnets and these areas are being approved for exploration and leasing. With respect to gem garnet leasing and public collecting, Alternatives B and C would also approve prospecting and exploration activities within the project area. The prospecting permits for ECGC which would likely lead to future lease applications for garnet sand mining being submitted to the USFS for analysis and approval. Alternative C would approve prospecting and exploration activities outside of a 30-foot buffer on either side of the East Fork and West Fork for commercial sands. The 30-foot stream buffer restriction would significantly reduce the amount of garnet sand reserves by decreasing the economic viability of many of the narrower garnet sand deposits. Both alternatives would be consistent with the original intent of the lands being acquired and would provide the best situation for future management of the garnet sand resource through the leasing process. Alternatives B and C represent a balanced approach ensuring that both commercial leasing and collecting are viable activities in the future. This is consistent with the original intent of the lands being acquired as well as subsequent management direction. Alternative A is not consistent with Forest Plan standards for minerals and would require a Forest Plan amendment for implementation. Additionally, Alternative A would not meet the original intended purpose of the land acquisition for a significant portion of these lands. Alternatives B and C are consistent with all Forest Plan minerals direction and standards.

Noxious Weeds

Noxious weeds are those plant species that have been officially designated as such by federal, State or County officials. Any ground disturbing activities associated with the alternatives may result in the creation of new habitat for noxious weeds. Design criteria exist

to limit the spread of weed seed and establishment of new populations, but are not expected to halt such spread completely. In addition, weed control as outlined in the St. Joe Noxious Weed Control EIS projects may potentially occur and would reduce the extent of existing weed populations. Garnet digging and testing is not expected to add to the cumulative effects within the project area. Ground disturbance may occur from hand digging but will be very small in scale. Increases in light levels can play an important role in allowing weed establishment. Testing and digging will not result in an increase in light levels since activities will take place under the existing canopy. The overall effect of all activities is expected to result in the gradual increase in weed numbers within the area over time if control methods are not employed. Such increases may not be discernable within the time frame of this project, and will vary depending upon the extent of disturbances.

According to the Idaho Panhandle Forest Plan (1987) direction, infestations of many noxious weed species, including spotted knapweed, meadow hawkweed, and goatweed are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established. The provisions for minimizing weed spread in Chapter 2 would meet this goal. The No Action alternative would also meet the intent of the Forest Plan.

Threatened, Endangered and Sensitive Plants

Ground disturbing activities have the potential to impact Endangered, Threatened, Proposed, and Sensitive (TES) plants. Regional direction (Leonard, 1992) states that the need for and extent of field reconnaissance should be commensurate with the risk associated with the project and species involved, and the level of knowledge already in hand. Field surveys will be conducted in all areas slated for project activities that contain high potential suitable habitat. Surveyors will walk through activity areas with the potential to contain TES plants during the growing season of those species likely to be found there. A general survey will be conducted, with more time being spent in special habitats. If any rare plant individuals are found, intensive searches will be conducted within the area. In the event that any TES plant populations are found prior to project implementation, the District Botanist will implement any necessary mitigation measures. As described in the design features of Chapter 2, population viability would be protected, although some isolated individuals may be impacted by activities.

All of the proposed alternatives, with requirements for surveys and implementation of mitigation measures, would meet the intent of the Forest Plan. The No Action Alternative would also meet the intent of the Forest Plan.

Range

Cattle and sheep have grazed in the area of Emerald Creek since the 1920's and 1930's prior to land acquisition by the Forest Service. Catspur Creek also has had grazing since the 1950s. There are no known direct or indirect effects from the No Action Alternative. Current stocking levels and grazing practices will continue. Recreational digging in 281 gulch will continue but is not an area utilized by cattle and therefore will have not effect on grazing.

For Alternative B and C, the extent of testing disturbances with respects to grazing should be small to nonexistent given their scope. For Alternatives B and C under the Catspur Creek

prospecting permit, all digging performed would be done by hand, and therefore the extent of disturbed ground will be kept small. Unauthorized digging for garnets currently occurs in the same section along a tributary of Cat Spur Creek. This digging is also done by hand. These actions are not likely to affect grazing. The proposed sites for recreational digging all lie outside of the areas used for grazing and should have no effect on grazing outside of continued vehicular traffic within the allotment.

Management directive states that “grazing management will protect soil and water resources, riparian areas, and T and E species” (Forest Plan II-7). The Forest Plan standard states that “opportunities for grazing and other uses of public range resources will be managed to serve the welfare of local residents and communities “(Forest Plan II-31). All of the proposed alternatives with requirements for surveys, monitoring and implementation of mitigation measures would meet the intent of the Forest Plan.

Recreation

The recreational opportunities within this project area are primarily associated with the Emerald Creek Garnet Area. This summary will focus on this site. For further information, please see Chapter 3. The Emerald Creek Area has long been known as a unique gem collecting area in Northern Idaho. Today the Garnet Area continues to be known internationally for its rare star garnets, which are more valuable than star sapphires and star rubies. This is the only site in the United States, and is one of only two places in the world (Idaho and India) where star garnets, are found. For 27 years the Garnet Area has opened and operated from Memorial Day weekend through Labor Day weekend. The current dig operation is in 281 Gulch. For Alternative A, after the current dig areas are depleted, the recreational digging activities would be closed down. Signs and vehicle wheel stops in the parking area would be removed. The existing 281 Gulch parking area would serve as a dispersed campsite. The A-frame and toilet buildings would be removed. Test hole digging would not occur to determine the extent of gemstone deposits in Garnet Gulch, 281 Gulch, Pee Wee Gulch, No Name Gulch, Strom Gulch and Wood Creek.

After digging in 281 Gulch is completed, recreational digging for the Idaho Star Garnet would no longer be available to the public. Recreational activity associated with garnet digging would decrease. Unauthorized garnet digging would likely increase within the project area. Additional law enforcement efforts would be needed to patrol and enforce recreational and commercial closures. Problems experienced in the area prior to the 1974 opening of the Garnet Area would resurface. These problems were described in Emerald Creek Garnet Area, St. Joe National Forest, also known as Appendix AA to the Forest Plan:

“Prior to 1969 a large amount of time was spent by rockhounds digging in the side drainages of Emerald Creek. Unsafe and unsanitary conditions existed. Used toilet paper and related materials, lunch wrappers and discarded clothing could be found scattered around the digging sites. Trees were undermined by garnet seekers to possibly later topple in a windstorm. Unsafe trenches and tunnels were built to later collapse or present the unwary with a deep water hazard. At one time dynamite was used which placed others in the area in danger.”

Economic benefits would be lost. Stores, cafes, gas stations, laundromats and motels in Fernwood, Clarkia, Emida, St. Maries and surrounding areas would experience a decrease in tourism revenue currently brought in by the rockhounds.

Effects of Alternatives B and C are the same. The effects to the recreation resource are the same with both these alternatives. Recreational garnet digging would continue in another drainage once 281 Gulch is completed. After recreational digging on the West Fork reached the confluence of the East and West Forks of 281 Gulch, all operations would begin July 1st to allow for fish spawning in the stream. The garnet digging would no longer open Memorial Day weekend. It would operate from July 1 through Labor Day. These more limited hours would remain as long as the digging is in fish -bearing streams.

Alternative A would not meet the Forest Plan standards or direction for recreation after garnet digging was completed in 281 Gulch. The standards for both Management Area 1 and Management Area 4 state "The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience in accord with its current management direction." (Forest Plan, III-2) A Forest Plan amendment may be required to change the standards.

Both action alternatives would be within Forest Plan Standards for recreation.

Scenic Quality

Numerous Federal laws require all Federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning and project design, implementation, and monitoring. Land management activities can affect the scenic resource and landscape character because of contrasts created between natural or natural appearing forested landscapes and those unacceptable modified by management activities. Alternative A is the No Action alternative. There would be no direct or indirect effects from implementing this alternative. The activity areas for both action alternatives are primarily limited to small areas within several drainages. For the scenic resource, these two alternatives are considered to have the same effects.

Alternative A is within Forest Plan Standards. Immediate activities proposed for Alternatives B and C are within Forest Plan Standards for scenic resources. The potential development scenarios for the commercial sand mining in the East Fork of Emerald Creek may be "an exception" for unusual situations. However, this is also within Forest Plan Standards. The effects can only be estimated until a Lease Application and Operating Plan are submitted.

Soils

Alternative A: Recreational digging is expected to increase the level of sediment in the East Fork and main stem Emerald Creek. Combined with sediment generated from roads and other activities (grazing, private land mining and timber harvest (see fish report for listing of past, recent and future activities)) may result in increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms. Soil compaction and productivity are not expected to change form the continued operation of the recreational digging, because the areas are rehabilitated. Some soil displacement will occur as evident in the water samples from 281 Gulch tested for suspend sediment. But with the use of a suction dredge and removal of the estimated amount of sediment entrained from the digging operation no increased cumulative impact is expected.

Alternatives B and C: Alternative B would have greater cumulative effects than Alternative C because of the channel and stream bank alterations. Some soil displacement will occur as evident in the water samples from 281 Gulch tested for suspend sediment. From recreational

digging an increased level of sediment in the East Fork and main stem Emerald Creek. Combined with sediment generated from roads and other activities (grazing, private land mining and timber harvest (see fish report for listing of past, recent and future activities)) may result in effects to beneficial uses because of increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms. But with the use of a suction dredge and removal of the estimated amount of sediment entrained from the digging operation no increased cumulative impact is expected. No significant effect to soil productivity is expected because of the small extent of activity and stockpiling of topsoil. Compaction and displacement are not expected to occur because the excavated material is returned to the site where it came from. Erosion is not expected to be significant because of the small areal extent of the explorations and gemstone mining on Bechtel Butte and implementation of the design criteria in Chapter 2.

The IPNF Forest Plan direction for soils will be met because soil productivity is not expected to change if the design criteria of Chapter 2 are followed, which includes applicable BMPs. Objectives under the Clean Water Act will also be met if the design criteria are followed and the suction dredge is used to remove entrained sediment. Suspended sediment sampling will determine the amount from the recreational extraction of gemstones.

Water

Commercial Exploration would occur on five sites. With mitigation measures including the 30-foot buffer from stream channels in Alternative C, short duration (a few hours per trench) and small areal extent (approximately 0.01 acres per trench) of the exploration trenches no effects to the soil or water resources are expected. Total ground disturbance is 0.01 acre in the West Fork Emerald and Hidden Creeks and 0.02 acre in the East Fork Emerald Creek and in Bechtel Creek.

Recreational exploration would occur in Wood Creek, No Name, Pee Wee, Strom, 281 and Garnet Gulches. Because these drainages have narrow valleys, exploration pits or trenches would have a ten-foot buffer from stream channels. It is estimated that up to 60 test sites could be implemented in each drainage. This would be a combination of auger holes, hand – dug pits and machine –dug trenches. With mitigation measures including the 10-foot buffer from stream channels, short duration (a few hours per trench) and small areal extent (approximately 0.003 acres per site) of the exploration pits no effects to the soil or water resources are expected. As noted throughout the EIS, after commercial testing for garnet sands, ECGC may submit a lease application and plan of operations for mining in the East Fork of Emerald Creek. This will require detailed analysis and a NEPA decision at that time but this analysis has estimated those effects and mitigation measures are noted in Chapter 2 of this DEIS.

Recreational Gemstone Extraction

Gemstone extraction is currently occurring in the West and East Forks of 281 Gulch. The disturbed area is approximately 0.1 acre (200' x 25') in the West Fork 281 and 0.05 acre (100' x 25') in the East Fork 281. There is an estimated sediment load coming from this operation of 0.1 cubic yards of material with a mean value of 2.1 cubic yards. This amount of estimated sediment will need to be removed from East Fork Emerald Creek to meet the no net increase in sediment to 303(d) listed streams, policy of the Idaho Department of

Environmental Quality and IPNF direction. If this and other design criteria are followed no effect to water or soil resources are expected.

Private Activities

Activities on private lands include timber harvest, garnet sand mining, grazing and farming. The activities proposed under the decision of this NEPA document will not have an effect to water quality, quantity or timing, stream channels or Beneficial uses as described above. Removal of sediment that would be introduced to the stream system is the main qualifying reason behind this no effect determination. The Garnet Mining Company is planning 20 acres of garnet sand extraction on private land in the West Fork of Emerald Creek. The State of Idaho and its permitting process control impacts from this activity.

IPNF Forest Plan consistency with State Water Quality Standards and stream channel integrity, for recreational and commercial exploration, permit issuance for gemstone extraction and recreational gemstone extraction, will be attained through application of design criteria and BMPs, including listed provisions in the DEIS, Appendix B of IDL-Bureau of Mines, Chapter 2 (Idaho, 1992). Use of a suction dredge to remove introduced sediment will also keep the activity in compliance.

Riparian Habitat Conservation Area Management Objectives will not be compromised provided all design criteria in Chapter 2 are applied. Channel rehabilitation following relocation or reconstruction may actually achieve, or move conditions toward meeting, the RHCA objectives through incorporation of large woody debris and significant riparian plantings.

Compliance with the Clean Water Act and Idaho Water Quality Law are expected if design criteria are followed, because suction dredging will remove introduced pollutant sediment and no other pollutant increase is expected. Channel rehabilitation following relocation or reconstruction may actually achieve, or move conditions toward meeting, the RHCA objectives through incorporation of large woody debris and significant riparian plantings.

Wildlife

Pileated Woodpecker

Alternative A would result in the potential loss of a low number of trees that may include existing snags and/or trees providing cavity habitat. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable pileated woodpecker habitat or affect pileated woodpecker populations.

Alternatives B and C would impact less than 2 acres of suitable upland habitat in each home range. Sufficient suitable habitat to support pileated woodpeckers would remain in all home ranges. There would be no measurable effect on pileated habitat. The previous analyses of size class and cavity habitat also indicate that effects on habitat for pileated woodpeckers would be negligible.

Elk

Alternative A would not affect elk.

Effects of Alternatives B and C on elk would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable elk

Moose

Effects of Alternative A on moose would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable moose habitat or affect moose populations.

Alternatives B and C would further reduce the riparian area adjacent to the E.F. Emerald Creek suitability as moose habitat. The additional impacts would not be expected to appreciable add to existing impacts on moose habitat.

Bald Eagle

Alternative A would cause no management-initiated change in bald eagle habitat or use.

Forest Service testing, recreational mining at Forest Service sites, approval of prospecting permits, approval of the lease on Bechtel Butte, and garnet sand mining in the tributary to the W.F. Emerald Creek in Alternatives B and C not effect bald eagles or their habitat.

Garnet sand mining in the E.F. Emerald Creek may alter incidental occurrences of bald eagles but would have no effect on any nesting eagles or populations.

Gray wolves, fisher, pine marten, wolverine, northern goshawks, black-backed woodpeckers, flammulated owls

There would be no adverse effect from any of the alternatives.

Coeur d'Alene Salamander

Alternative A would not affect Coeur d'Alene salamander habitat or populations.

The risk of adverse impacts on Coeur d'Alene salamanders and/or their habitat in Alternatives B and C is very low. Based on this low risk, the relative abundance of sites elsewhere on the district and within its range, and the relatively low importance of the E.F. Emerald Creek to the persistence of the Coeur d'Alene salamander the proposed actions may impact individuals and/or populations but would not adversely affect population viability of the species.

Boreal Toad

Based on their continued existence at impacted sites and the availability of habitat throughout the Emerald Creek drainage, the impact on riparian habitat from Alternative A are not expected to affect the population viability of boreal toads.

Based on their continued existence at impacted sites and the availability of habitat throughout the Emerald Creek drainage, the impacts to riparian habitat from Alternatives B and C are not expected to affect the population viability of boreal toads.

Northern Leopard Frogs

Alternative A would have no management-initiated effects on northern leopard frogs or their habitat.

There would be no effects from Alternatives B and C.

Wildlife Consistency with Forest Plan and Laws

All alternatives are consistent with applicable goals, direction, standards, and guidelines from the Forest Plan for the management of wildlife habitat and species populations. All alternatives to varying degrees comply with other direction and recommendations regarding management of the various components of wildlife habitat. All alternative comply with applicable Conservation Strategies for wildlife species. All alternatives are consistent with the ESA, NFMA and other laws providing direction and requirements for the management of wildlife species and habitat.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

AIR QUALITY

Regulatory Requirements

IPNF Forest Plan contains Forest Wide Standards for air quality (page II-34) including:

Participate with the State and others in the development and implementation of State Implementation Plans (SIP) that are compatible with management objectives for the IPNF.

All projects, contracts and permits must comply with procedural and substantive requirements of the Clean Air Act, State Implementation Plans and State Smoke Management Plans.

Develop and use alternative slash (biomass) disposal methods that are practical and biologically sound.

Encourage utilization of Forest products to reduce biomass which must be disposed of otherwise.

There are no air quality standards specific to management areas within the project area.

The conformity provisions Sec. 176(c) prohibits any federal agency from taking any action that causes or contributes to violations of the National Ambient Air Quality Standards (NAAQS). The *de minimus* levels for conformity for PM 10 (*particulate matter less than 10 microns in diameter*) is 100 tons per year per project.

Analysis Area

The Garnet Stars and Sands project area is within North Idaho Airshed 12A (see project file for map). The boundary of 12A encompasses the area from the Washington State line east to Dworshak Reservoir and from the St. Joe/Coeur D'Alene divide south to the Clearwater - Nez Perce Forest Boundary. The cumulative effect analysis area is the project area. Effects of the project are limited to dust and vehicle exhaust which will not be transported out of the project area in an amount that will be measurable or identifiable outside of the project area.

The Clean Air Act designates Class I, II, and III areas for air quality management. All of the IPNF is designated as Class II airshed, described as having good air quality with no additional air quality restrictions other than NAAQS.

Analysis Methods/Tools

Effects of the project on air quality are limited to dust and vehicle exhaust. The assessment is based on visual inspection of the project area under current conditions. A qualitative judgment was made based on a description of the proposed activities. Previously completed environmental documentation of expected effects of adjacent projects were used for cumulative effects analysis (Hidden Cedar Project DEIS and St. Joe Noxious Weed Control Project FEIS).

Particulate matter affects air quality and is composed of several substances. The largest portion consists of soil or dust that becomes airborne due to vehicles, wind, construction or agricultural activities. It also comes from burning fossil fuels (e.g., gasoline, diesel, natural gas, fuel oil, and coal), smoke or ash from wood burning, agricultural burning, or forest fires (Idaho DEQ, 2001).

Existing Condition

The air quality of the Garnet Stars and Sands project area is generally considered good throughout the majority of the year due to good air dispersion. Human caused and natural events inside and outside the project area do occasionally affect air quality. Human influences such as stationary industrial pollution sources, woodstoves, exhaust from vehicles and road dust are very minimal, however regional haze occasionally occurs due to agricultural dust, agricultural field burning, and forest slash burning. Natural events such as dust storms and wildland fires have reduced air quality at times.

Roads in the project area are gravel or dirt surfaced and during summer months, the roads dry out and dust is kicked up by vehicles. This dust generally drifts off and settles out of the air within 3 minutes. Continual traffic can keep an area dusty. In areas of residences on the way to the project area, dust control measures such as watering or application of other dust abatement is regularly applied. Current recreational, industrial and administrative activities in this area contribute little additional pollutants to the local airshed. The primary source of pollution would be from vehicular exhaust and dust from motor traffic in the area.

Winds in the project area are usually calm. The mountainous terrain somewhat protects the valleys from high winds, which are only occasionally experienced, usually associated with a thunderstorm or frontal system. This reduces the opportunity for blowing dust from activity areas and roadways. Winter, spring and fall are relatively wet, reducing dust production from activities and road use. Late spring to early fall is really the time when conditions are dry enough to necessitate dust abatement measures.

The project area atmosphere was occasionally smoky and had a general haze from nearby fires as well as fires elsewhere in the northern Rocky Mountains.

Environmental Consequences

Direct and Indirect Effects

Alternative A:

Alternative A is the No Action Alternative, under which there would be no change from current management direction or from the level of management intensity in the area for the next five years or so. Dust would continue to be created from recreational, industrial and administrative vehicle use on existing gravel and dirt roads. Air quality would remain good. Eventually, existing sources of developed recreational digging opportunities and industrial garnet mining will be exhausted, and these activities will cease, resulting in a reduction in the dust and vehicle exhaust that are associated with these activities. These impacts are so small currently that the reduction will not lead to a noticeable improvement in air quality in the project area.

Alternatives B and C

Public Recreational Gemstone Digging Areas, Lease Applications, Prospecting Permits and Lease Renewal

The effects of these alternatives in the same as Alternative A with the exception that the effects would be extended into the future for the duration of the project instead of activities ceasing in five years or less. Dust and vehicle emissions created by the test digging and subsequent recreational digging activity may continue to have an immediate impact on air quality in the area of the activity.

Test digging and activities would create vehicle exhaust, but in amounts so small it would not impact air quality such as occurs when a vehicle passes on a dusty road. Impacts would be limited to the area directly adjacent to and during activity and for the few minutes it takes following the activity for dust to settle and exhaust to dissipate. Effects would occur at current levels. Air quality would remain good.

Reclamation

Reclamation would entail working with heavy equipment and would thus create exhaust and dust. Impacts are expected to be less than that generated by mining and recreation activities, and would not be noticeable except possibly in the immediate area of the reclamation activity. Air quality would remain good.

Cumulative Effects

Alternative A

Smoke from wildfires from outside the project area would add some accumulations to the air quality during the summer and fall. Field burning and dust from wind storms in agricultural areas west of the project area will continue to rarely reduce air quality in the project area.

Wildfire smoke has naturally been a part of the project area ecosystem. The frequent fire return intervals of the drier ponderosa pine forests to the west and local wildfires surrounding the project area as well as the severe and mixed intensity fire regimes of the project area generated smoke quite often during summers. Wildfire smoke has been reduced in the Garnet Stars and Sands project area where fires were kept small and quickly extinguished. The amount of smoke generated from forest fires has decreased since the 1930s and the advent of effective fire suppression. Prior to this time the northern Rocky Mountains probably had 1500-2000 fires burning annually. Before modern fire suppression these fires burned until they naturally went out and many burned for prolonged periods of 60-120 days. Journals from early day explorers and newspaper articles from the late nineteenth century often mention the smoky conditions in Western Montana and Northern Idaho.

Quick fire initial attack and mop-up of wildfires will continue to greatly reduce smoke production and duration from levels that occurred before 1930.

Prescribed fire from outside the project area will generate smoke during the spring and fall months. Agricultural burning restrictions on the Palouse have reduced levels regional haze from that source.

Activities associated with the Hidden Cedar Project (if an action alternative is selected) could impact the air quality through activities within the project area and outside of the project area. Impacts could occur from vehicle exhaust and dust in a small way. Impacts may occur from prescribed fire for fuel reduction. Prescribed burning is regulated by the North Idaho Smoke Management Memorandum of Agreement. Smoke produced will be dispersed generally to the northwest by prevailing winds over unpopulated forest lands and away from the Garnet Stars and Sands project area.

Since the annual production of PM 2.5 and PM 10 for the Hidden Cedar project is less than 100 tons per year, based on a three-year duration, no conformity determination is required to meet the Clean Air Act (Hidden Cedar DEIS, 2001).

Grazing allotments within the project area will be sprayed for noxious weeds as planned in the St. Joe Noxious Weed Control Environmental Impact Statement. The proposed weed treatment would have short-term, localized impact on air quality because of the drift of spray particles. Generally the greatest part of this drift would settle within 25 feet of the site, although small amounts could carry greater distances (USDA Forest Service, 1993). The smell of chemicals such as 2,4-D may also persist at a spray site for several days following spraying.

Application of herbicides to control weeds is to be accomplished under strict guidelines to protect the health of personnel. Areas to treatment will be posted following spray activities so that people who want to avoid these areas can. Inhalation exposures of herbicides experienced by casual forest visitors would be very minimal.

Overall, air quality would remain good in the project area most of the time, the exceptions being periods when outside influences such as wildfire smoke or dust from wind storms decrease air quality.

Cumulative Effects

Cumulative effects would be the same as those described in Alternative A with the exception that localized impacts would continue for 7 – 10 years longer, contributing an unnoticeable amount of dust and vehicle exhaust to the air. Air quality would remain good, with the exception of periods when influences outside of the project area are reducing air quality. Project activities would not contribute to the decrease in air quality during these times.

Compliance with Regulations

The project is consistent with Forest Plan standards for air quality. It will not produce smoke and there are no opportunities to use biomass in ways other than burning.

Since the annual production of $PM_{2.5}$ and PM_{10} for the Garnet Stars and Sands project is less than 100 tons, no conformity determination is required to meet the Clean Air Act.

FISHERIES RESOURCE

Regulatory Framework

The Forest Plan for the Idaho Panhandle National Forests (United States Forest Service 1987) designates management goals. Included in these management goals are: goal #11 Manage the habitat of animal and plant species listed under the Endangered Species Act to provide for recovery as outlined in the species recovery or management plans. Manage habitat to maintain populations of identified sensitive species of animals and plants, #13) manage fisheries habitat to provide a carrying capacity that will allow an increase in the Forests' trout populations; #18) maintain high quality water to protect fisheries habitat, water based recreation, public water supplies, and be within state water quality standards; and #19) manage resource development to protect the integrity of the stream channel system. In addition, the Inland Native Fish Strategy (INFish), which amended the Forest Plan, establishes criteria for designating riparian habitat conservation areas (RHCA's) and provides additional standards and guidelines for management activities with respect to RHCA's and riparian management objectives (RMO's). INFish standards, which have been applied to the types of activity proposed in this project, include Minerals management standards: MM-1, MM-2, MM-3, MM-5, and MM-6.

Management of National Forests is also guided by other Federal mandates. The National Forest Management Act (NFMA) (1976) requires that the Forest Service manage for a diversity of fish habitat to support viable fish populations. Regulations of NFMA (219.12g) state, "Fish and wildlife habitats will be managed... to maintain and improve habitat of management indicator species." The 1969 National Environmental Policy Act (NEPA) requires an environmental analysis of projects to ensure the anticipated effects upon all resources within the project area are considered prior to project implementation. Section 7 of the 1973 Endangered Species Act (ESA) includes direction that Federal agencies will not authorize, fund, or conduct actions that are likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. Executive Orders 11988 and 11990 (May 24, 1977) contain as part of their objectives minimizing the destruction, loss, and degradation of wetlands, and to give preferential consideration to riparian dependent resources when conflicts among land use activities occur. Executive Order 12962 (June 7, 1995) states objectives "to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by: (h) evaluating the effects Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order." Additional regulatory requirements related to fisheries resources (*e.g.* Clean Water Act and Idaho Water Quality Standards, Idaho 303(d) list) are addressed in the Soil and Water Resources Review.

Analysis Area

The Stars and Sands Analysis Area is located in the upper portion of the St. Maries River watershed in Townships 43N., Ranges 2W. (Boise Meridian) in Latah, and Benewah

Counties, Idaho. The primary named streams included in the analysis area are: the mainstem of the St. Maries River, Emerald Creek, East Fork Emerald, 281 Gulch, Garnet Gulch, No Name Creek, Pee Wee Creek, Strom Creek, West Fork Emerald, a tributary to the West Fork Emerald, the West Fork of St. Maries, Cat Spur, a tributary to Cat Spur Creek, Bechtel, Hidden, and Wood Creeks. The St. Maries River converges with the St. Joe River at St. Maries, Idaho to make the St. Joe basin. The Stars and Sands project area (approximately 32,000 acres) accounts for 10% of the St. Maries River watershed (312,500 acres); the St. Maries watershed is 28% of the St. Joe River basin (1,128,359 acres). The St. Joe River feeds into the southern portion of Coeur d'Alene Lake, which is also fed to the north by the Coeur d'Alene River. Coeur d'Alene Lake and its tributaries form the upper Spokane River basin, which occurs, within the interior Columbia River basin.

The cumulative effects area for fisheries resources is defined as the St. Maries River watershed at the confluence of Emerald Creek but excludes the Middle Fork St. Maries River. This area was selected for fisheries resources because it contains all potential project activities and defines the largest watershed area that allows for the greatest level of resolution for determining a project's contribution to cumulative effects operating at various geographic scales.

Ecosystem Context

Fish Populations

The U.S. Fish and Wildlife Service (USFWS) lists bull trout as a "threatened" species and westslope cutthroat trout as a "Species of Concern" with respect to section 7(c) of the 1973 Endangered Species Act (ESA) (3/2/98 letter, FWS 1-9-98-SP-100). Westslope cutthroat trout were petitioned to be listed under the ESA but USFWS determined on April 14, 2000 that the listing was “not warranted at this time”. Both fish species are listed as "species of special concern" by the State of Idaho and the westslope cutthroat trout is listed as a "sensitive species" by Region 1 of the USDA Forest Service. Torrent Sculpin (*Cottus rhotheus*) were added to the sensitive species list for the Idaho Panhandle National Forests on March 12, 1999.

Population status reviews of bull trout and cutthroat trout have found considerable reductions in the distribution and abundance throughout their historic range (Rieman, et al 1997, USDA Forest Service 1996a; Rieman and McIntyre 1993; Apperson *et al.* 1988). In a status review of bull trout on the Idaho Panhandle National Forests, stocks from the St. Joe River system are considered to be at moderate risk of extinction (Cross 1992). Thurow et al 1997, estimated that westslope cutthroat trout populations were present in 85% of the potential range but only 22% of the potential range was classified or predicted as strong. Population status reviews of the westslope cutthroat trout in Idaho has determined that populations have declined over their historic distribution. It is estimated that strong westslope populations persist in only 11% of their historical range (Rieman and Apperson 1989) and only 4% of the populations are not threatened with hybridization. Viable populations are believed to exist in only 36% of the original Idaho range (Duff 1996; Rieman and Apperson 1989). The U.S. Fish and Wildlife Service reviewed the status of Westslope Cutthroat trout in 1999 in respect to a petition for listing the species. That review agreed that the populations have been reduced

from historic levels, but determined that it was not a candidate for listing due to the lack of potential threats to the remaining population (USDI 2000)

Fish Habitat

Interior Columbia River Basin

Quigley *et al.* (1996) report that in 1993, President Clinton mandated an effort to produce a scientifically sound and ecosystem-based strategy for managing public forests within the interior Columbia River basin (ICRB), among others. In the process, a Science Integration Team (SIT) was responsible for conducting detailed functional assessments that would lead to an integrated assessment of the geographic area. Quigley *et al.* (1996) document some of the assessment findings for the ICRB, which also help to synthesize and interpret conditions in the Stars and Sands analysis area.

The SIT found that road densities are inversely correlated to fish population strength. Designated wilderness and potentially unroaded areas are identified as important anchors for stronghold populations. Major decreases in pool habitat (both frequency and quality) in past 40-60 years are attributed to losses in riparian vegetation, road construction, timber harvest, grazing, farming, and other disturbances (*e.g.* mining). In-stream woody debris and fine sediment characteristics are also reportedly influenced by management activities. The greatest losses for aquatic habitat are in low gradient, biologically productive areas. Changes in the composition, distribution, and status of fish within the ICRB are extensive. Habitat fragmentation and population isolation have rendered many changes irreversible but core areas remain for rebuilding and maintaining functioning native aquatic systems. Exotic species introductions have diversified or otherwise provided for angling opportunities in areas where angler harvest or habitat conditions would not allow natural reproduction to sustain a fishery. Fish stocking has provided socio-economic benefits in these areas. However, this practice has also increased the opportunity for species hybridization, competition, predation, displacement of native fish species, introduced pathogens, and perhaps an unintentional acceptance of lower quality standards for the aquatic environment.

Quigley *et al.* (1996) helps characterize the St. Joe River basin with respect to general conditions of the interior Columbia River basin (ICRB). The St. Joe River system was rated as having moderate aquatic integrity, high hydrologic integrity, but low composite ecological integrity. River systems with moderate aquatic integrity generally support important aquatic species where native species strongholds occur in some tributary watersheds but have been lost or are at risk in other tributary watersheds. These systems typically retain connectivity between the various watersheds with a mainstem river system, which can facilitate species dispersal to potentially allow restoration of life-history patterns of native fish throughout the system. Systems with high hydrologic integrity possess resilient vegetation in uplands and riparian/floodplain areas, exhibit hydrologic processes, which limit the effects of sedimentation and erosion, and permit infiltration, percolation, and nutrient cycling that provides for productive terrestrial and aquatic environments. The St. Joe River system received a relatively low rating for composite ecological integrity when the integrity ratings for forests, rangeland, hydrologic, and aquatic components were synthesized and compared across the ICRB.

Primary risks to ecological integrity include: 1) risks to hydrologic and aquatic systems from certain land management activities and the fire potential, 2) risks to late and old forest structures in managed areas, and 3) risks to forest composition resulting from a susceptibility to insect, disease, and fire. Primary opportunities to address risks to ecological integrity include: 1) restoration of late and old forest structure in managed areas, 2) connection of aquatic strongholds through restoration, and 3) treatment of forested areas to reduce susceptibility to fire, insects, and disease. The St. Joe River system was classified as Forest Cluster 4, which exhibits high restoration potential with much to gain and little to lose from efforts that attempt to restore conditions.

St. Joe Geographic Assessment:

The IPNF conducted a geographic assessment (GA) of the St. Joe River Basin in 1995-96 (United States Forest Service 1997) to refine the scale of analysis conducted at the ICRB geographic scale. A team of Hydrologists, Fisheries Biologists, and Soils Scientists from the IPNF used information from this effort to described conditions of the basin as they relate to aquatic resources. In addition, the relative condition of the various sub-watersheds (landscape analysis areas) within the St. Joe River Basin was evaluated to gain a perspective on how the sub-watersheds contribute to the over-all function of the river system. Information from the GA is used to convey a river basin perspective of the characteristics of aquatic resources in the Stars and Sands area, which lies within the Emerald Creek and Sherwin-Staples landscape analysis areas.

The St. Joe River basin GA indicates that the general trend for the St. Joe River system from Gold Creek downstream (including the St. Maries River system) is toward impaired in-stream habitat conditions while habitat conditions upstream of Gold Creek are relatively secure, with few exceptions. The GA considered the stream system in the Stars and Sands area to currently be operating outside of dynamic equilibrium. The general status of in-stream habitat across the river basin has reduced the strength of native fish populations, particularly salmonid species.

The St. Joe River basin GA identified no streams in the Stars and Sands area as focal or adjunct habitats or critical contributing or key watershed areas at the river basin scale indicating a lower priority for aquatic restoration efforts in this area. The biological assessment completed for bull trout populations in the St. Joe watershed (United States Forest Service 1998) identified the Stars and Sands area for aquatic habitat maintenance or improvement.

Stars and Sands Project Area

Drainage Condition

The Stars and Sands analysis area is characterized by a moderately to highly weathered geologic landscape consisting primarily of schist, quartzite and gneiss geology types. These types exhibit moderate to high erosion hazards when exposed to rain or melting snow. The terrain consists of varied topography where generally broad floodplains of larger order streams give way to adjacent hillslopes of moderate to steep relief. Stream networks begin as small, higher gradient reaches and progress into lower gradient stream reaches that

exhibit relatively high channel sinuosity and width:depth ratios. Elevations range from approximately 2,800 feet to 4,740 feet above sea level. Much of the Stars and Sands area is within an elevational zone generally considered to be most sensitive to effects from rain-on-snow. Hydrologic openings are common within the Stars and Sands area. Annual precipitation is typically 35 inches and is snow dominated. Rain-on-snow events may generate floods. The watershed has a general north-facing aspect. Riparian areas vary from forested stands of evergreen trees primarily along smaller order streams to open pastures along broad floodplains. The total road density within the area is 5 miles/mile^2, which is considered extremely high according to criteria in the Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia River Basin (Quigley *et al.* 1996). Roads increase sedimentation to streams. This increase in sedimentation over natural background levels can fill pools, silt spawning gravels, decrease channel stability, modify channel morphology and reduce survival of emerging salmon fry (Quigley et al. 1997). These changes to instream habitat conditions have a negative effect of fish populations.

Fisheries streams include small, high gradient stream reaches used primarily for spawning and early rearing of coldwater fish as well as lower gradient streams used primarily for rearing, over-wintering, and migration corridors. Emerald Creek, East Fork Emerald, West Fork Emerald, 281 Gulch, Pee Wee Creek, Garnet Gulch, No Name Creek, Cat Spur Creek, Bechtel Creek, Hidden Creek, Wood Creek, West Fork St. Maries and the mainstem of the St. Maries River are the primary fish bearing streams in the analysis area although others exist.

Results from stream surveys suggest that aquatic habitat composition and cover characteristics are impaired but are generally sufficient to support TES/MIS fish. Habitat in river tributaries is particularly homogenous. Stream substrate is largely dominated by sand and fines in low gradient reaches, but increases to gravel-size and occasionally larger material in higher gradient reaches toward the headwaters. The high percentage of small substrate particles limits spawning habitat for salmonid species. Riparian areas along well-developed floodplains, particularly those of larger streams, exhibit impacts from land uses such as mining, grazing pastures and roads. This condition contributes to reduced forested riparian areas, elevated stream temperatures, channel instability, increased sediment production, and increased nutrient loading. Pieces of instream large woody debris are abundant but an over-whelming majority of these are short and old indicating limited recruitment sources.

Land Ownership

Land in the Stars and Sands area is owned and managed by public and private entities. The U.S. Forest Service manages approximately 64% of the Stars and Sands area as part of the National Forest System. The largest contiguous block of National Forest land is located in the central portion of the analysis area although smaller blocks are located throughout the area. Lands other than those managed by the Forest Service account for approximately 36% of the Stars and Sands area. Potlatch Corporation and the State of Idaho Department of Lands are managed as industrial forests. Other privately owned parcels are primarily used for cattle grazing and other agricultural interests. Privately owned land is scattered

throughout the analysis area and occupies most of the land along the St. Maries River floodplain.

Historical Influences

Findings reported in Quigley *et al.* (1996) help explain population trends found in the St. Joe River basin and are applicable to fisheries resources in the Stars and Sands area. Natural disturbance regimes (flooding as recent as 1996) and related processes (*e.g.* erosion, sediment routing, watershed hydrology, woody debris recruitment, aquatic habitat maintenance) have been altered in the St. Joe River basin by human activity most notably since the late 1800's. Land use activities that have modified natural disturbance characteristics include railroads and roads, flumes and chutes, dwellings and towns, grazing, farming, mining, stream modifications (constriction, channelization, diversion, dams, culverts, and woody debris removal), logging, and fire suppression. Many of these human influences are considered press-type disturbance that continue to affect the condition and trend for fisheries resources in various portions of the river basin. Press disturbance differs from pulse disturbance in several aspects but generally press disturbance is persistent and impairs the ability for ecosystems to recover to pre-disturbance conditions (Reeves *et al.* 1995). The recovery process from pulse disturbance within the Stars and Sands area has been hindered by the persistence of effects from various press disturbances. The following discussion relates these findings to the condition of the aquatic environment within the Stars and Sands area.

Roading activity (e.g. construction, reconstruction, and maintenance), timber harvests, mining and grazing activity during the twentieth century have been the primary land management influence on the condition of the aquatic environment in the Stars and Sands area. These activities have combined with and influenced the magnitude of impacts as well as the rate of recovery from natural disturbance to the environment.

The combined effects from disturbance mechanisms such as roads, timber harvests, and grazing pastures have contributed to vast riparian areas being dominated by grass and shrub species and influenced the condition of riparian dependent resources in the Stars and Sands area. Data from aquatic habitat inventories in the Stars and Sands area suggest the prolonged absence of forested stands in these areas has impaired the protection of stream temperatures due to reduced streamside canopies (i.e. stream shade) (see project file). As a result, the main stem of the St. Maries River and the West Fork St. Maries River are listed on the 303(d) list by the State of Idaho as water quality limited for non-support of salmonid spawning and coldwater biota. One of the primary pollutants of concern is stream temperature. Many riparian areas are decades away from offering stream shade without actively promoting timber stand development in riparian areas.

The Stars and Sands analysis area has a hydrograph dominated by snow-melt and is particularly susceptible to influences of hydrologic openings due to its elevational range. Openings in the forest canopy in systems such as these can contribute to more rapid melting of the snowpack and affect the timing and intensity of water run-off. Several authors (Jones and Grant 1996, Satterlund and Adams 1992, Chamberlin *et al.* 1991, Gottfried 1991, King 1989, and others) have reported on the relationships between hydrologic openings, water yield characteristics, and in-channel processes related to stream channel stability. Stream

channels in the Stars and Sands area have historically been affected in this way due to considerable losses of forest structure as a result of timber harvesting activity.

Riparian areas of within the Stars and Sands project area have been negatively affected due to timber harvest, roads, mining and grazing. Riparian areas affected in this way typically offer less protection for stream temperatures due to reduced streamside canopies (i.e. stream shade) and reduce the Large Woody Debris (LWD) recruitment potential to streams which can inhibit the development and maintenance of diverse habitat conditions (including quality pool habitat and complex cover) (Connolly and Hall 1999).

Roads are often associated with mass erosion during flood events, accelerated stream sedimentation rates, reduced channel stability, impaired floodplain functions, reduced LWD recruitment potential, reduced stream shade, fish migration barriers, and otherwise inhibited development and maintenance of quality fish habitat characteristics (Baxter *et al.* 1999; USDA Forest Service 1996b; Furniss *et al.* 1991; Yee and Roelofs 1980). Roads within RHCA's can be particularly impactive to riparian areas and lead to impaired conditions for stream resources. Nearly 38.5 miles of road occur within RHCA's in the Stars and Sands area. These roads contain numerous stream crossings. Several of these inhibit migratory fish access to suitable aquatic habitat and likely contribute to reduced productivity for fisheries resources within the Stars and Sands area.

The prolonged absence of forested stands from riparian areas has also contributed to the lack of LWD recruitment. Aquatic habitat in the Stars and Sands area can be generally described as relatively homogenous with little structural diversity (other than bedrock and boulders) and low cover complexity. Results of the survey data indicate that the instream habitat conditions described are the primary factors limiting populations of threatened and sensitive fish in the Stars and Sands area. This supports previous conclusions reached by fisheries biologists from the USFS and IDFG for this portion of the St. Joe River basin. Though existing LWD abundance appears high, most pieces are small and old remnants of historic levels of LWD. Many riparian areas do not have the potential to recruit a sufficient quantity of LWD in the near term to replace existing LWD that is rapidly decaying. This condition will increasingly inhibit the development and maintenance of diverse habitat conditions including quality pool habitat and complex cover (Connolly and Hall 1999).

Mining activity within the project area includes both permitted garnet digging and unregulated digging. This activity often occurs within the stream channel. Disturbance of spawning fish, damage to eggs within the gravels and increased sediment are all potential impacts of this activity.

A comparison between current and reference conditions for fish habitat and populations suggests that the quality of fisheries resources in the Stars and Sands area has generally been compromised by land management activities. Existing conditions of the habitat components (stream temperature regimes and physical aquatic habitat – composition, complexity, substrate) that are primarily responsible for regulating populations of native salmonids in this area are adequate to support populations of coldwater biota (albeit at suppressed levels), particularly westslope cutthroat trout. However, the apparent absence of reproducing populations of bull trout from the Stars and Sands area indicate there has been an extended period of time that the more rigorous habitat requirements of this species have

not been met within the Stars and Sands area. Results from the analysis of fish habitat and population conditions indicate that many streams in the analysis area continue to be affected by the combination of historic pulse-type and on-going press-type disturbances.

A discussion of the current fisheries conditions will be described in greater detail for individual streams under the heading Current Condition and Effects Analysis, Habitat Conditions.

Analysis Methods

Fish Population

Fish species presence and distribution was determined based on a review of historical literature, electro-fishing surveys, snorkel surveys, spawning surveys and incidental sightings during habitat surveys.

Current Habitat Condition

The existing conditions of the fisheries habitat in the Stars and Sands area were established by utilizing professional interpretation of information from stream inventories, field reviews, historical records, aerial photographs, an analysis of watershed conditions, published scientific literature, IDFG, USFWS, and comprehensive knowledge of the fisheries resources in the St. Joe River basin (see project file). The District Fisheries Biologist validated aquatic habitat conditions during field reconnaissance surveys. Existing conditions were evaluated for primary habitat components believed to be influencing the productive potential of the fisheries resources (*i.e.* MIS fish) within the cumulative effects area. These include water quality (*e.g.* stream temperatures), aquatic habitat quality, cover complexity, and riparian condition. Other selected features (such as substrate composition and channel stability) that can influence the status of fish habitat or fish populations in the Stars and Sands area were also considered.

Aquatic habitat conditions are based on qualitative and quantitative field surveys. Quantitative surveys were conducted using standardized methods (USDA 1997). This methodology delineates stream reaches according to the Rosgen channel classification system (Rosgen 1991) and further classifies discrete in-stream habitats. Physical measurements such as length, width and depth are measured for each habitat unit. In-stream cover is quantified in all habitats except riffles and cover complexity is evaluated for pool units. Notes were recorded regarding such details as fish observations, potential fish migration barriers and sources of degradation to stream channels and riparian areas. Water temperatures were recorded using stream temperature recorders.

The status of the current condition was determined based on a comparison of the existing condition to the reference condition

The reference condition, is the condition, which represents the natural range of conditions for the project area. Current condition for each fish bearing stream will then be assessed to determine if it is functioning appropriately, functioning at risk or functioning at unacceptable risk. A watershed is functioning appropriately when it maintains strong and significant native fish populations that are interconnected and promotes recovery of habitat to a status that will

provide self-sustaining and self-regulating populations. A watershed is functioning at risk when it provides for the persistence of native species but in more isolated populations and may not promote recovery of habitat without active or passive restoration efforts. A watershed is functioning at unacceptable risk when native species are absent from historical habitat, or are rare or being maintained at a low population level; although the habitat may maintain the species at this low persistence level, active restoration is needed to begin recovery. This determination is independent of the percentage of land which is managed by the Forest Service. Therefore if a stream is determined to be functioning at unacceptable risk, the ability of the Forest Service to alter this determination is dependent on the amount of federal ownership in the drainage.

Limiting Factor Assessment

Potential limiting factors for aquatic ecosystems may be numerous (Everest and Sedell 1984; Orth 1987). Many discussions have been held between biologists from the USFS and Idaho Department of Fish and Game (IDFG) over the past several years concerning factors that limit fish populations in the St. Joe River basin. Fine sediment that is detrimental to fish egg survival (Chapman and McLeod 1987) (particle size <.6mm) is a consideration for aquatic inhabitants within the cumulative effects area for this project as the IPNF Forest Plan suggests. However, there is an inherently high occurrence of fine sediments as a function of the schist geology as well as soils in low lying areas that are largely remnant lakebed deposits from Miocene Lake Clarkia. Results from field surveys support the professional consensus reached between biologists of the USFS and IDFG that stream habitat degradation (loss of overwintering habitat) and impaired water quality (high summer water temperatures) presently plays the most important role in population regulation by influencing carrying capacity and over-wintering survival (Sedell et al. 1988; McFadden 1969; Bjornn 1971).

Reference Condition

Fish Species

Bull trout and westslope cutthroat trout were historically documented in the Stars and Sands area (Maclay 1940, Fields 1935). Bull trout and westslope cutthroat trout exhibit three life history strategies. Averett and MacPhee (1971) and Bjornn and Liknes (1986) report that resident, fluvial, and adfluvial life history strategies of westslope cutthroat trout occur in the St. Joe River system. Resident populations remain in river tributaries throughout their life. Migratory populations (fluvial and adfluvial fish) use river tributaries for early rearing and spring spawning but migratory fish typically out-migrate to river (fluvial) or lake (adfluvial) over-wintering habitat as they mature. In the fall, fish that have not previously returned to river and lake areas migrate to deeper water where they congregate and over-winter (Bjornn 1975). Adopting resident and migratory life history forms helps ensure greater species viability through time by reducing the probability that all individuals will be extirpated by a single catastrophic event. Widespread and persistent conditions that compromise stream carrying capacities may have a greater impact on population viability.

Habitat Requirements

Natural events and processes historically dictated environmental conditions across the St. Joe River basin. Effects from natural disturbances such as historic volcanic eruptions (*e.g.* Mt. Mazama and Mt. St. Helens), alpine glaciation, fires, landslides, and flooding interacted with other land evolving processes (*e.g.* geologic up-lift and stream channel down-cutting) to form the basic character of watersheds and the dependent stream resources. Biological communities including native fish populations evolved with these processes to develop functional ecosystems, which possessed an inherent resiliency to effects from natural disturbance regimes representing pulse-type disturbance (Reeves *et al.* 1995). Pulse disturbances influence the natural range of environmental conditions that are expected for ecosystems functioning at broad geographic scales but typically allow systems to begin recovering to pre-disturbance conditions in a timely manner.

It is difficult to ascertain discrete values that accurately reflect reference conditions for fisheries resources in the Stars and Sands analysis area given the extent of natural spatial and temporal variation across the St. Joe River basin. Broad characterization of historical conditions for fisheries resources are possible based on the evolution of the landscape. Geological characteristics and major land forming processes in the area provide helpful clues for framing reference conditions for fisheries resources. The Stars and Sands analysis area is largely composed of underlying schist geology. In addition, the previous existence of Miocene Lake Clarkia has also had a lasting influence on fisheries resources. These factors combine to dictate a range of reference conditions for fisheries resources in the St. Maries River basin (including the Stars and Sands area) that is uncharacteristic of most other portions of the St. Joe River basin.

Reference stream morphology in the Stars and Sands analysis area would likely have been dominated by channels with lower gradients and higher sinuosity than they are today – C, E, and F Rosgen channel types (Rosgen 1994). Aquatic habitats associated with these channels would likely have included a diverse mix of riffles, runs, and pools. It is expected that beavers would have been a more significant influence on channel morphology and associated habitat conditions in the area. Stream substrate and bank material would have been shifted toward smaller sized particles (*i.e.* cobble size and smaller) as a function of the highly weathered schist geology.

Fines would have been prevalent in the system (particularly in low gradient reaches) due to natural erosional processes acting on highly weathered geology and remnant lakebed sediments. The inherent level of fines in the system would likely have concentrated salmonid spawning to higher gradient reaches where clean spawning gravels would have naturally been maintained by flushing flows that transported fines to lower gradient reaches. Reference conditions for instream cover would likely have consisted of a high percentage of undercut banks, over-hanging terrestrial vegetation, and accumulations of large woody debris. Fish populations utilizing streams in the Stars and Sands area would have had access to all suitable habitat and moved freely throughout the system to fulfill habitat needs as dictated by their life histories.

The preferred habitat of bull trout and westslope cutthroat trout can be generalized as cold, clear streams that possess rocky, silt-free riffles for spawning and slow, deep pools for

feeding, resting, and over-wintering (Young 1995; Reel *et al.* 1989). Pools are a particularly important habitat component (Bonneau 1994). Mesa (1991) found that cutthroat trout occupy pool habitat more than 70% of the time. Other key features of aquatic habitat are LWD for persistent cover and habitat diversity as well as small headwater streams for spawning and early rearing. Although the preferred habitat for bull trout and westslope cutthroat trout is similar, bull trout are reported to have more rigorous habitat requirements (Rieman and McIntyre 1993; Fraley *et al.* 1989).

Stream temperature is one of the primary environmental factors that influence the distribution of bull trout and westslope cutthroat trout populations (Bonneau and Scarnecchia 1996; Young 1995; Saffel 1993; Rieman and McIntyre 1993; Hunt 1992). Both species rely on cold water but bull trout reportedly have a greater requirement for water temperatures to remain below about 15^{O}C (Rieman and McIntyre 1993; Fraley *et al.* 1989). Other habitat requirements vary by age of the fish and season of the year (Baltz *et al.* 1991; Moore and Gregory 1988; Rieman and Apperson 1989; Campbell and Neuner 1985). Young-of-the-year fish initially seek stream margins with heterogeneous habitat structure. Juvenile trout populations are virtually nonexistent where this habitat is absent (Moore and Gregory 1988). As fish grow larger and mature they seek out deep water habitat types such as pools and deep runs (Baltz et al. 1991; Hickman and Raleigh 1982). Good salmonid rearing habitat includes abundant cover. Several authors have noted the importance of complex habitat with abundant cover for bull trout (Watson and Hillman 1997; Rieman and McIntyre 1993; Fraley *et al.* 1989). Dolloff and Reeves (1990) reported young Dolly Varden (Salvelinus malma), a species closely related to bull trout, most frequently used woody debris as cover. Also, cutthroat trout typically seek deep water associated with large woody debris during winter (Moore and Gregory 1988). Connolly and Hall (1999) found that LWD abundance was the variable that best explained cutthroat trout biomass during studies in the Oregon Coastal Range.

Torrent Sculpin were recently added to the sensitive species list for the Idaho Panhandle National Forests. Torrent sculpin primarily inhabit larger streams and Lee *et al.* (1980) indicates that torrent sculpin are found within the St. Joe River system. Freshwater sculpin of the genus *Cottus* usually spawn in spring (April to June depending on species) when eggs are laid on the under surface of rocks in cobble-boulder areas (Lee *et al.* 1980). The preferred habitat of sculpin generally includes coldwater riffle habitat in medium to wide streams and rivers though large adults (>150 mm) are found in pools (Markle *et al.* 1996). Sculpin are commonly found in streams of all sizes throughout the St. Joe River basin.

Current Condition

Fish Species

Various surveys have been conducted recently in the Stars and Sands analysis area to assess fish populations. Electrofishing and snorkel surveys were conducted in 1999, and 2001 and cutthroat redd surveys were conducted in 1998. Fish observations were also noted during aquatic habitat inventories and reconnaissance surveys in 1998, 1999, 2000 and 2001.

Recent surveys in the Stars and Sands area show that westslope cutthroat trout (as well as sculpin species) continue to persist but bull trout are largely absent. Many details of historical and present fish population dynamics in the Stars and Sands area are unknown but the persistence of westslope cutthroat trout populations suggests that this area retains some stream characteristics that reflect those under which the species evolved.

Bull Trout

Genetic analysis has shown bull trout populations in the St. Joe River system to be a unique stock though they are closely linked to the upper Columbia River clad - one of three major groupings of bull trout throughout the Columbia and Klamath River drainages (Williams, unpublished). Currently, bull trout are known to occupy river habitat in the St. Joe River and occasionally stray up the St. Maries River during spring migration (angler accounts; Apperson et al. 1988). The historic range of bull trout includes the Stars and Sands area (Fields 1935) but they were last detected and documented in the Stars and Sands area (in the St. Maries River) during 1987 surveys (Apperson *et al.* 1988). Two unconfirmed sightings of *Salvelinus* species have been reported (Emerald Resource Unit EIS, 1993). No bull trout were found in the lower East Fork during electrofishing surveys in the summer 1992 or in August 2001.

Westslope Cutthroat Trout

Streams in the Stars and sands area are known to provide spawning and rearing habitat for migratory and resident populations of westslope cutthroat trout albeit at suppressed levels (survey data 1999, Averett and MacPhee 1971). **See** Table 3-1.

Torrent Sculpin

Lee *et al.* (1980) indicates that torrent sculpin are found within the St. Joe River system but the presence of this species has not been established within the Stars and Sands area. The distribution of sculpin species and the key considerations for managing their populations are generally contained within those for native bull trout and westslope cutthroat trout populations (coldwater MIS fish). In addition, management considerations for torrent sculpin are addressed during the analysis for coldwater MIS fish.

Fish population surveys also confirmed the presence of native shorthead sculpin (*Cottus confusus*), northern pikeminnow, and introduced brook trout within the Stars and Sands area. Other fish species that are native to the St. Joe River basin have access to fish bearing streams throughout the area and may be present at various times of the year. These include mountain whitefish, largescale sucker, longnose dace, and redside shiner. Fields (1935) reported that stocking of exotic rainbow trout historically occurred in the West Fork St. Maries River during the early part of the century. The Idaho Department of Fish and Game continues to stock catchable-size, sterile rainbow trout in the St. Maries River and some of these fish may disperse to streams in the area (Chip Corsi, personal communication). Native bull trout and exotic brook trout hybrids are also potentially present but have not been detected in the Star and Sands analysis area. Table 3-1 identifies streams with known presence of various fish species.

Management Indicator Species

Native bull trout and westslope cutthroat trout have been selected as MIS for the fisheries analysis of this watershed. Rainbow trout are not native to streams in the St. Joe River basin (although they are stocked to supplement the fishable population) and therefore were not selected as MIS for this project

Table 3-1 - Fish Distribution Based on Various Survey Methodologies

Stream Name	Survey Method[1]	Bull Trout	Westslope Cutthroat Trout	Brook Trout	Sculpin
Emerald	E[2]				
EF Emerald	E		X	X	X
Trib to WF Emerald	E				
Little East Fork Emerald	E		X	X	X
281 Gulch	E		X		
Pee Wee Gulch	E		X		
Garnet Gulch	E		X		
No Name Gulch	E		X		X
Strom Gulch	H				
Cat Spur	E		X		X
Hidden	S and E		X	X[3]	X
WF St. Maries	E		X	X	
Wood	E		X	X	X

1). S = Snorkel survey, E = Electrofishing survey, H = Habitat Survey (incidental observation)

2) Based on electrofishing conducted by Konopacky Environmental for the Emerald Creek Garnet Company

3) Brook trout were not located in the upper survey reach

Habitat Condition

The following table and text display the issue indicators or measurable factors for each of the streams within the project area. These features help determine the current condition and trend of the stream and its potential.

The information provided in the following table is the professional opinion of the District Fisheries Biologist and District Hydrologist, based on field reviews of the streams. Width to Depth ratio describes the cross-sectional shape of a stream channel. H = high means the channel is wide and shallow; M = moderate, L = means channel is narrow and deep. Streambank condition describes the stability of the banks. G = Good, >80% of any stream reach has ≥90 % stability; F= fair, 50-80% has ≥90% stability; poor=, <50% has ≥ 90% stability. Floodplain connectivity: G = good, off – channel areas are frequently hydrologically linked to main channel, overbank flows occur and maintain wetland functions, riparian vegetation and succession; M = moderate, reduced linkage of wetland floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency as evidenced by moderate degradation of wetland function, riparian vegetation/succession; P =

poor, severe reduction of hydrologic connectivity between off-channel, wetland, floodplain area riparian area wetland extent drastically reduced and riparian vegetation/succession altered significantly.

Table 3-2 - Stream channel conditions

Stream Name	Width to Depth Ratio	Streambank Condition	Floodplain Connectivity
Emerald Creek	H	P	G
East Fork Emerald	M	G	M
281 Gulch[1]	M	G	G
Garnet Gulch	M	G	G
No Name Gulch	M	G	G
Pee Wee Gulch	M	G	G
Strom Gulch	M	G	G
Little East Fork Emerald	L	G	G
West Fork Emerald	M	F	G
WF Trib 33	L	G	G
WF St. Maries	M	P-F	G
Cat Spur	M	F	M
Hidden	L-M	G	G
WF St. Maries	M	P-F	G
Wood	L-M	G	G

The following paragraphs provide specific information about stream temperatures, chemical contaminants, habitat diversity, pool frequency, size of pools, and substrate.

St. Maries River (Mainstem)

The St. Maries River within the project area is approximately 8.1 miles long. It is primarily a low gradient, meadow stream, which meanders through a well-developed floodplain for most of its length. The River provides spawning, rearing, and over-wintering habitat for native salmonids and other fish species. This stream also serves as a migration corridor for non-resident fish that utilize river tributaries. Only small sections totaling about 27% of the mainstem flow through National Forest land.

Designated beneficial uses include cold-water biota and Special Resource Waters (IDAPA58.01.02, Idaho Department of Health and Welfare 2000). Stream temperatures recorded by the USFS from late July through mid-October, 1998 upstream from Cedar Creek ranged between 3°-24° C (see project file). Temperatures greater than 22°C exceed the Idaho State standard for coldwater biota. The St. Maries River exceeded this criterion on 15 days. There may have been more days in exceedence prior to the placement of the temperature recorder on July 30.

Riparian conditions along the St. Maries River are also influencing the quality of the aquatic habitat. Private homes, grazing pastures, and the Cedar Creek Campground are distributed along the mainstem. Although private homesites are located primarily outside of flood prone areas, some sections of the river channel have been straightened to accommodate

developments in the floodpiain. In addition to stream channelization, much of the riparian area has been altered by agricultural uses such as cattle grazing. Pasture conditions are prevalent along the river where grasses account for much of the riparian vegetation. Shrub species including alder, dogwood, and willow are present along some riverbank areas. Tree species are less abundant along the riverbanks and associated floodplain.

Roads and a railroad also occur along the St. Maries River. State Highway 3 parallels the river but is located mostly along the outer fringe of the floodplain away from the river channel and does not constrict routine peak flows. A railroad grade parallels the river, lies closer to the river channel, and likely affects floodplain functions during routine peak flows. State Highway 3 and the railroad grade each cross the mainstem of the St. Maries River with a bridge near Cedar Creek. No river crossing has been identified as a fish barrier.

Emerald Creek (mainstem)

Emerald Creek drains approximately 11,420 acres (17.8 square miles) and is a relatively large tributary to the St. Maries River. Emerald Creek is listed as an "undesignated surface water" by the State of Idaho (IDAPA 58.01.02). This means that criteria related to the support of cold water aquatic life, and primary or secondary contact recreation will apply to Emerald Creek.

Emerald Creek flows entirely through private ownership lands. Much of this land is utilized as grazing pasture and is primarily devoid of timber, expect along a short section of stream just upstream of the confluence with the St. Maries River. This stream has also been mined for garnet sands along certain sections. Restoration efforts were made along these sections, recreating a meander pattern, installing some woody debris and planting brush along the banks.

A salmonid population survey was conducted within two sections of Emerald Creek, approximately 4,000 m and 405m in length, in 1993 by Konopacky Environmental working for the Emerald Creek Garnet Company. This survey located no salmonids in the surveyed section. The company that collected the population data also collected stream temperature data from July 1993 through June 1995. Temperatures as high as 24.8 ºC were recorded in July 1994. Temperatures in July and August of 1994 exceeded Idaho State Standards several times.

East Fork Emerald Creek

The following description of the East Fork of Emerald Creek is based in part on a review of information provided in the Emerald Resource Unit Environmental Assessment (1993). That description uses information from the quantitative fish habitat survey conducted in 1992, field reviews conducted by the district fisheries biologist and district hydrologist in 2000 and 2001, and a qualitative fish habitat survey conducted in 2001.

Mining and timber activity have had a long term and influential impact on the fish habitat of this drainage, starting as early as the1860's. Other impacts to the stream include grazing, railroad construction and recreational activities. These activities have changed fish habitat and channel stability by channelizing and relocating sections of stream (1 ½ miles of stream), removing instream woody debris, and removing overhead cover. Some woody debris is

being added to the stream as pieces of the old railroad deteriorate and collapse into the channel and large woody debris was added to the East Fork by the Forest Service to increase the diversity of fish habitat. Anecdotal reports state that garnet mining began in the East Fork of Emerald Creek in the mid-40's. This early mining occurred on the lower approximately 2.5' miles of stream.

Fish habitat was surveyed in the lower 4 miles of the East Fork up to the confluence with the Little East Fork Emerald in 1992 and again in 2001 (project file document titled "Fish Habitat Summary Table, E F Emerald"). The 1992 survey determined that 43% of the surveyed stream length was pool habitat, 37% was riffle/run, and 20% was glide. The 2001 survey reports habitats are essentially the same as the 1992 survey. The minor difference could be a result of surveyor bias or due to the lower water levels during the 2001 survey. The 2001 survey reports 49.9% pool habitat, 49.4% riffle/run habitat and very minor amounts of glide and braiding, 0.5 and 0.2% respectively. These percentages describe a stream with fairly good diversity of habitat, although only reach 9 meets the InFish riparian management objective (RMO) for pool frequency. Pool habitat is fairly well represented however the quality of the pool habitat was low. The lack of quality pools is related to the shallowness and lack of cover (7%) and especially lack of wood debris cover (2%) based on 1992 surveys. Instream cover in the summer is greater due to the amount of aquatic vegetation. This type of cover is not as useful as woody debris because it does not persist through the winter and does not provide the complexity of woody debris. The potential for large woody debris recruitment to the stream is low due to the limited amount of riparian trees.

Channel stability survey analysis indicates that the lower portion of the East Fork is moving toward dynamic equilibrium (Emerald Resource Unit FEIS, 1993).

The upper portion of East Fork, upstream of Little East Fork, is primarily runs and pools. Beaver activity is common in this section and is creating pools and slack water areas. Upstream of East Fork Emerald and Pee Wee Creek confluence the East Fork valley bottom narrows, and has a coniferous riparian zone.

There are 10 sections, totalling approximately 10,000', of the East Fork Emerald, which are listed as potential development for extraction of garnet sands. The three sections furthest downstream have shrubs and forbs lining the banks but conifers are within 50' of the channel. The fourth section, moving upstream, has primarily a shrub/forb riparian zone, with a short segment that includes conifers located between the stream and road 447. This section was straightened during previous mining activity, which occurred adjacent to this section. The fifth section is a shrub/forb riparian zone with occasional conifers on the floodplain. The stream is located primarily on the southeast side of the valley bottom is receiving shading due to the proximity with the hillside. Section six again is a shrub/forb riparian zone. It also contains a patch of larger size conifers on the floodplain. The remaining four sections are very similar, shrub/forb/grass riparian zone with very few if any conifers on the floodplain. The stream is primarily on the south/southeast side of the valley bottom in these locations and is receiving some shading due to the proximity to the hillside.

There are no known physical barriers to fish migration from the St. Maries River to habitat in the East Fork Emerald.

East Fork Emerald is the largest tributary, which could possibly be affected by this proposal. Because of its size, this stream provides the majority of the overwintering area for the fish using this drainage.

281 Gulch

The following description of 281 Gulch is summarized from the Fisheries Biological Assessment written for the Emerald Creek Recreational Garnet Area (1999), review of historic aerial photographs, a monitoring report from 1999 (project file document titled," Project Monitoring related to Emerald Creek Recreational Garnet Digging Fall Rehabilitation Review"), and a quantitative stream survey conducted in 2001 (project file document titled "Fish Habitat Summary Table, 281 Gulch"). The habitat survey was conducted on approximately 3300'

281 Gulch is a small drainage of less than 400 acres. Timber harvest activity prior to 1933 treated approximately 65% of the lower portion of the drainage (review of 1933 aerial photographs). The district cultural resources specialist states that the area was likely broadcast burned following the harvest. Forest Service operated recreational garnet mining began in this drainage in 1985 and has continued to the present. Activity began at the upper ends of the west and east forks and has been working progressively downstream. Currently operations are occurring a short distance upstream of the confluence of the East and West Forks. The current operating season is from July 1 (East Fork) and Memorial Day weekend (West Fork) until Labor Day weekend. Following the seasonal closing the stream is rehabilitated to reduce the amount of sediment produced from the mined sections. During the extraction season the East Fork is diverted through a pipe approximately 150m long. Settling ponds have been constructed below the mining activity on both forks to reduce the amount of sediment which continues downstream. There are several other mitigation measures which have been utilized to reduce the amount of sediment being transported downstream by this operation (see Recreation section of this document). The District Hydrologist has conducted monitoring of this operation (see project file document titled Hallisey, 1994)

A District Fisheries Biologist reviewed stream conditions in 281 Gulch during a reconnaissance survey on September 30, 1998. This stream is best characterized as a small B-type channel (Rosgen 1994) for most of its length. Riparian vegetation along the stream banks and immediate flood plain areas is primarily brush species with timbered areas encroaching from the lower hillslopes. Mined areas adjacent to the stream are largely devoid of brush and tree species though grasses occur in rehabilitated sections. Stream substrate is generally small sized ranging from small gravel to fines. Substrate composition is largely a function of the parent schist geology but a fining of substrate downstream of mining activity further restricts the quantity and quality of spawning habitat. Rearing habitat for salmonids is also limited as pools are generally small and shallow. The habitat survey (2001) determined that pools comprised only 10.8% of the habitat in the East Fork. The majority of the habitat was riffle habitat (76.8%).

No habitat surveys were conducted in the West Fork because it is not utilized by fish.

The inherent properties of 281 Gulch (e.g. small size and schist geology) naturally limit the potential for aquatic habitat conditions regarding native trout. However, land management (activities primarily associated with mining and timber harvesting) within 281 Gulch has maintained aquatic habitat conditions below that potential. Numerous cutthroat trout have been observed in and upstream from the sediment settling pond in the east fork of 281 Gulch near its confluence with the west fork. No fish have been observed in the west fork of 281 Gulch in or up-stream from the existing sediment pond. Also, no bull trout have recently been reported within the project area or surrounding streams.

Based on this review, 281 Gulch is being used primarily as a spawning and early rearing stream.

Garnet Gulch

Garnet Gulch is a small drainage, which has received extensive management activity in the past. A review of historic aerial photos (1933) indicates that approximately 85% of the drainage was harvested and according to the district cultural resources specialist was likely broadcast burned following the harvest. There has been no organized Forest Service garnet mining operation in this drainage but anecdotal information about the mining of the Emerald Creek area reports that unregulated rock hounding did occur in this drainage (project file document titled “Early mining of Emerald Creek”, dated March 12, 1991.

There have been several reviews of this stream; a qualitative review in 1999 conducted by a District Fisheries Biologist (project file document titled “East Fork of Emerald Creek and Tributary Monitoring for June 1999), a qualitative review of this stream conducted in July 2000 by the District Fisheries Biologist (project file document titled “Garnet Gulch Stream Review 2000”), and a quantitative survey conducted in June 2001 (project file document titled “Fish Habitat Summary Table, Garnet Gulch”). The quantitative survey was conducted on approximately 3,400’ of stream.

Garnet Gulch passes through a culvert immediately upstream from its confluence with the East Fork. The culvert is approximately 36”, with almost no jump required to get into the culvert. This culvert is probably a low flow migration barrier. The channel went subsurface for about 4’, approximately 60’ upstream of the culvert, due to bedload and debris plugging the channel. The stream averages about 4’ wide. The substrate is predominately gravel. Woody debris is plentiful and stable in the channel. The qualitative survey identified that the instream habitat was primarily run and pool (see project file document “Fish Habitat Summary Table, Garnet Gulch”). Pool habitat was primarily created by woody debris. Pools were slightly more developed in the second reach. The second reach contains two large (22.7 and 13.5 m long), human created pools. It is not known whether these were constructed in association to mining or harvest activity. The riparian zone is primarily forbs with some conifers. The vegetation becomes denser moving upstream to a point where it is difficult to see the channel.

A presence/absence electrofishing survey was conducted in August 2000. The survey was conducted on 18.4 meters of stream upstream of the culvert under road 447. This survey identified only westslope cutthroat trout as being present Garnet Gulch.

Based on this review Garnet Gulch is considered to be supplying spawning and early rearing habitat for westslope cutthroat trout.

Little East Fork Emerald

This drainage is the second largest drainage in the project area. A review of historic aerial photographs (1933) indicates that timber harvest prior to 1933 occurred on approximately 25% of the drainage, primarily in areas adjacent to the stream. There was also a railroad system constructed up this drainage to facilitate the removal of the timber. There remains evidence of the old railroad system in the stream today. There has been no regulated garnet mining in this drainage.

In 2001 a quantitative survey was conducted by the USFS on approximately the lower 2 miles of stream (project file document titled "Fish Habitat Summary Table, Little E F Emerald"). This review divided the channel into 4 reaches based on channel form, valley bottom, gradient and substrate. The habitat has equal amounts of run and pool habitat, 28.1%. The next most common habitat is braided, 25.6%. Other habitats represented are; riffle, glide, and there are sections that go subsurface. This variety of habitat indicates a good diversity for this stream. The stream likely has more pools in the lower section of the stream than were present at the time of the survey because beaver have since moved into the system and have built dams, which are creating more pool habitat. Pool habitat in general appears to be somewhat underdeveloped because residual pools depths are only slightly higher than those found in Garnet Gulch, a much smaller drainage. The riparian zone was primarily brush at the lower end of the stream.

A presence/absence electrofishing survey was conducted in July 2001. This survey identified westslope cutthroat trout, sculpin and brook trout. The catch per unit effort was 6.2 fish/100 sec.

Based on these reviews, Little East Fork Emerald Creek is considered to be supplying spawning, early rearing and overwintering habitat for westslope cutthroat trout, sculpin and brook trout.

No Name Gulch

No Name Gulch is a small drainage, which has received extensive management activity in the past. A review of historic aerial photographs (1933) indicate that almost this entire drainage (~95% based on aerial photograph estimation) was harvested and according to the district cultural resources specialist was likely broadcast burned following the harvest. No Name Gulch was mined for garnet gems from 1974 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream about 700'. At this point the stream forked, approximately another 1000' of stream up the left fork of No Name and approximately 500' up the right fork of No Name were also mined. There are a variety of reminders of the past mining still within the stream channel; metal fence posts, wood planks, etc

A qualitative review of this stream was conducted in July 2000 by the district fisheries biologist (project file document titled "No Name Gulch Stream Review") and a quantitative habitat survey was conducted in June 2001 (project file document titled "Fish Habitat

Summary Table, No Name Gulch"). The reviews began at the confluence with the East Fork of Emerald Creek. The quantitative review was conducted on approximately 1,300' of stream. The stream passes through a culvert just upstream of the confluence. The culvert is undersized as evidenced by the erosion around the inlet of the culvert. There is an old road that parallels the channel for about the lower ¼ mile of stream and according to the historic aerial photos (1933) the road continued up the left fork of No Name Creek.

No Name Gulch is a small stream averaging 3.3' wide, ranging between 1.6-5.9'. The qualitative survey divided the stream into two reaches based on valley bottom, gradient and substrate. The substrate is predominately small gravel. The lowest reach was predominately run habitat (52%). Riffle and pool habitats were represented in almost equal amounts 25.6 and 22% respectively. Approximately half of the pools are created by woody debris although the majority of the woody debris is small due to the limited amount of conifers in the riparian zone. Pools are less developed in this drainage than they were in Garnet Gulch. The riparian zone is primarily grass and forbs. Beyond the end of the old road the stream has greater quantities of woody debris and the riparian zone is predominately brush and sparse conifers.

A presence/absence electrofishing survey was conducted in August 2000. The survey was conducted on 18.4 meters of stream upstream of the culvert under road 447. This survey identified westslope cutthroat trout and sculpin.

The left fork of No Name Gulch was not quantitatively surveyed because it is not being utilized by fish. However a qualitative review of the stream located a section of headcutting a short distance up the channel from the confluence with the right fork of No Name Gulch.

Based on these reviews, No Name Gulch is considered to be supplying spawning and early rearing habitat for westslope cutthroat trout and resident habitat for sculpin.

Pee Wee Gulch

Pee Wee Gulch is the smallest drainage being proposed for activity within the project area. This drainage has received extensive management activity in the past. A review of historic aerial photographs (1933) indicate that almost this entire drainage (~95% based on aerial photograph estimation) was harvested and according to the district cultural resources specialist was likely broadcast burned following the harvest. Pee Wee Gulch was mined for garnet gems from 1979 until 1984. This mining occurred from the confluence with the East Fork of Emerald Creek upstream about 1100'. There are still fence posts, old bridge planks and other remnants of the mining activity in the stream.

The District Fisheries Biologist conducted a qualitative review of Pee Wee Gulch in May 2001 (project file document titled "Pee Wee Gulch Stream Review"), and a quantitative habitat survey was conducted in August 2001 (project file document titled "Fish Habitat Summary Table, Pee Wee Gulch"). The both reviews began at the confluence with the East Fork of Emerald Creek. The quantitative survey was conducted on approximately 2,671' of stream. There is a culvert under Forest Service road 447 approximately 120' upstream of the confluence. This culvert is not a migration barrier although it appears to be undersized for the 100 year flow.

Pee Wee Gulch is a small stream averaging 2.2' wide. The habitat is primarily riffle (62.3%) with minor amounts of pool habitat (2.4%) and 2.1% of the stream went subsurface. There was about 30.2% of the stream that was so densely overgrown with brush and forbs, that the surveyor was unable to determine habitat types within those sections. This stream had a very low amount of pool habitat as compared to the other small drainages within the project area, although the pools that did occur had similar physical attributes as those in the other drainages. The stream banks along Pee Wee Gulch were primarily lined with brush and forbs, and as described previously, it was very dense along some sections. There were occasional conifers within the riparian zone but conifers were primarily located on the sideslopes. The valley bottom varies from 10' wide up to 30' wide. The width of the valley therefore dictated how much influence the conifers on the sideslope would have on the channel. The substrate at the lower end of the stream was primarily gravel and sands, moving upstream the substrate increased in size with fines present.

A presence/absence electrofishing survey was conducted in August 2000. The survey was conducted on 2.2 meters of stream upstream of the culvert under road 447. This survey identified westslope cutthroat trout, the catch/unit effort was 5.2 fish/100 sec.

Based on these reviews, Pee Wee Gulch is considered to be supplying spawning and early rearing habitat for westslope cutthroat trout.

Strom Gulch

Strom Gulch is a small drainage, which has received extensive management activity in the past. A review of historic aerial photographs (1933) indicate that almost this entire drainage (~95% based on aerial photograph estimation) was harvested and according to the district cultural resources specialist was likely broadcast burned following the harvest. There was a road that paralleled the channel for the majority of its length. This road is now brushed in with remnants still visible.

The District Fisheries Biologist conducted a review of this stream in May 2001 (project file document titled "Strom Gulch Stream Review"). The review began at the confluence with the East Fork of Emerald Creek and reviewed approximately 2500' of stream. The stream passes through a culvert just upstream of the confluence. Strom Gulch is a bedrock cascade for approximately 825' upstream from the culvert with a gradient of ~23%. The bedrock cascade is a natural fish barrier to all species. Upstream of the bedrock cascade section the channel gradient is reduced, the valley bottom widens and the substrate changes to gravel and sands. The stream averages about 1 ½' wide. The water goes subsurface at various locations. There is an abundance of woody debris in the channel and the riparian zone has conifers including some that are very large. There is evidence of historic timber harvest in the riparian zone but trees were left.

The small size of this stream, combined with the natural barrier near the confluence makes this a non-fishery stream.

West Fork Emerald

The following description of the West Fork of Emerald Creek is summarized from the Emerald Resource Unit Environmental Assessment (1993), which included quantitative fish habitat

surveys conducted in 1992, walk through surveys and channel condition surveys. Field reviews conducted by the district fisheries biologist 2001 were done to determine if current conditions are similar to those described in the 1993 document. Conditions appear to be fairly similar.

There are no National Forest managed lands along the main stem of the West Fork. Sections of the West Fork were commercially dredge mined beginning in the 1930's and expanded in the 1940's. The mining displaced and straightened the channel in areas. Road development followed the logging trails up the creek bottoms during the 1930's. Beginning in the 1950's, additional roads were opened to access additional areas for timber harvest.

Walk-through surveys of the lower two miles of stream shows that habitat is primarily low gradient riffles and runs and has very little woody debris and overhead cover. The riparian area has been overturned by past mining activities, which removed most stream bank vegetation. Stream bank cover ranges from bare ground to alder brush and grass. Bank erosion occurs in some areas due to road construction, instability caused by mining activities and cattle use. In this area, fish habitat has been degraded.

The upper portion of the West Fork (upstream of Section 36) runs through a narrow canyon for about two miles and the through a wide flat valley for about 2 miles. Habitat in the canyon is primarily riffles and pools. Woody debris cover is fair and woody debris recruitment potential is good. Habitat in the valley is low gradient dam and backwater pools and runs created by beaver. Beaver activity within this two miles section has improved fish habitat quality by diversifying the habitat. However, overhead cover within this section is poor and is provided by brush. There are no trees next to the stream and woody debris recruitment potential is poor.

Channel stability surveys in the West Fork show that the upper reaches are stable and the lower reaches are not. The poor rating is due to riparian and channel disturbance from mining and roading.

Garnet sands extraction occurred in section 36 in the late 1990's. This section was rehabilitated as sections of the mining were completed. The rehabilitation included designing a new channel pattern, placement of large woody debris, and planting of the riparian zone with grasses, shrubs and trees. The rehabilitated section of stream appears to be recovering.

West Fork Emerald Tributary Section 33:

This tributary was reviewed in May 2001 by the district Fisheries Biologist, from the crossing under a private road in section 33 upstream to the crossing of Road 1487. Downstream of the culvert under the private road the stream flows through a wet meadow which has been mined. Upstream of the culvert the stream has been channelized along the road edge for about 500' before it enters a timbered area. The timbered area is only about 100' before the stream enters another area which was mined in 1996. The section through the second mined area has been reclaimed. The stream has been defined, log stepdown and log cover structures were installed, and the area was planted with lodgepole pine and alder. Because of the mining activity and the small size of the planted stock, this section of stream is completely absent of stream shading. The substrate of this designed section of stream is silt/fines and a very small percentage of gravels. The stream averages about 4' and ranges

from 2-10' wide. Large woody debris was installed during reclamation and appeared during the 2001 survey to be stable. The remainder of the stream is under National Forest Management. The stream is primarily an E6 channel type (Rosgen, 1994). The stream ranges from 2-10' wide and narrows to about 1' wide at the end of the surveyed section where road 1487 crosses. The gradient is relatively flat for the majority of the stream length surveyed but steepens near the crossing. The habitat types are primarily run followed by pool. There are a couple of areas, which are downcutting. Instream habitat overall is of moderate to good quality. There are areas of abundant instream woody debris, both large and small, undercut banks, and thick overhanging vegetation. The riparian zone was primarily timbered with an understory of brush near the banks. There were a couple of large meadows, which were human created. There are old cut stumps along the entire length of stream surveyed. Cattle are using the area and are causing some damage to banks.

A presence/absence electrofishing survey was conducted in July 2001. No fish were located during this survey.

Based on the above information, the tributary to the West Fork of Emerald Creek within the project area, is not directly utilized by fish but does provide water to the fishery of the West Fork.

West Fork St. Maries

The West Fork St. Maries River (hereafter called the West Fork) is primarily a low gradient, meadow stream, which meanders through a well-developed floodplain for most of its length. Beneficial uses in the West Fork are "undesignated", which means criteria for cold-water aquatic life will apply, (Idaho Department of Health and Welfare 2000). The West Fork provides spawning, rearing, and over-wintering habitat for native salmonids (primarily westslope cutthroat trout) and other fish species. This stream also serves as a migration corridor for non-resident fish that utilize river tributaries. Only small sections totaling about 21% of the West Fork flow through National Forest land. The remainder flows the commercial timber company lands, state lands and private ownership. The Idaho Division of Environmental Quality (DEQ) continuously recorded stream temperatures in the West Fork, upstream from Clarkia, from late June through mid-September, 1997. Temperatures ranged between 6°-22° $^{\text{Celsius}}$. These temperatures are just within the State standard for coldwater biota.

Evaluations of the existing stream habitat conditions are based primarily on stream data collected in 1998 and field validation surveys in 1999. The West Fork is over 9 miles long, only a portion, ~28%, was surveyed. The fish habitat survey began at the property boundary at the line between section 24 and 25 of T42N, R1E and ended where the West Fork crosses between sections 28 and 33 in T42N, R1E. This survey divided the stream into 3 reaches. The first two reaches were E channel types, which differed in the type of dominant substrate. The third reach was an F channel type. Habitat is fairly evenly divided between run, glide and pool habitats (project file). Overwintering habitat is created by habitat types, which are deep and have slower flows, primarily glides and pool, and to a lesser extent, deep runs. Therefore this combination of habitats indicates the importance of this stream for providing overwintering habitat.

Glide habitat comprises a higher percentage than pool and run habitat in reaches 1 and 2 (41.3 and 36.8% respectively) but, comprises only 2.2% in reach 3. Run habitat is slightly more prevalent than pool habitat in reach 3. Riffle and braid habitats are present in each reach but in very low amounts. Pool habitat is primarily created by meanders, almost twice as many as the second most common creator, large woody debris (LWD). Rootwads and beavers create the largest pools.

The distribution of sediment along the surveyed section of the West Fork, indicates that there is limited salmonid spawning available due to the large percentage of sand/fine substrate. Substrate size does increase slightly moving upstream in the surveyed section but still provides few areas of spawning. Sand, and fines are the dominant substrates in the lowest reach of the stream. Reach 2 has a larger percentage of gravel, but still includes a large percentage of sand.

Although the West Fork provides important habitat for native salmonids within the watershed, the quality of the habitat is impaired. Aquatic habitat lacks the complexity usually associated with quality habitat. In the two reaches where cover complexity was collected, 56% of the pools are rated below average, 28% average and 16% slightly above average. Structural cover components such as woody debris and undercut banks are considered more beneficial to the carrying capacity of native salmonids than non-structural components such as algae and whitewater. Cover in all three reaches is primarily algae, although undercut banks, and both small and large woody debris are present. The abundance of algae in the West Fork is likely the result of nutrient inputs from cattle grazing and the amount of direct sunlight reaching the stream.

Although some pools are deep, overall pool habitat is under-developed as pool depths and volumes are relatively low for a stream the size of the West Fork. Several factors likely contribute to the lack of pool development in this stream. Historical influences in the watershed have precipitated conditions that continue to work through the system. Current stresses from recent and on-going activity are complicating the ability of the stream to fully recover.

Sediment input is one factor that continues to degrade the quality of aquatic habitat. The West Fork is particularly sensitive to sediment production due to the energy poor hydrologic conditions inherent to its channel morphology. Stream channels that exhibit low gradient and high sinuosity like the West Fork are inefficient at routing sediment through the system. Excessive sediment delivery to these types of channels often result in deposition and a loss of pool capacity for rearing fish.

Riparian conditions along the West Fork are also influencing the quality of the aquatic habitat. The town of Clarkia, private homes, grazing pastures, and a log yard are distributed along the West Fork. Although Clarkia and other private homesites are located primarily outside of flood prone areas, some sections of the river channel have been straightened to accommodate developments in the floodplain. Aerial photo interpretation indicates stream channelization is most persistent in limited portions of the lower West Fork near Clarkia and in the upper West Fork near Hidden Creek. None of these areas are located on National Forest. In addition to stream channelization, much of the riparian area has been altered by agricultural uses such as cattle grazing. Pasture conditions are prevalent along the river

where grasses account for much of the riparian vegetation. Shrub species including alder, dogwood, and willow are present along some riverbank areas. Tree species are less abundant along the riverbanks and associated floodplain.

Roads and a railroad also occur along the West Fork. State Highway 3 parallels the river but is located mostly along the outer fringe of the floodplain away from the river channel and does not constrict routine peak flows.

A railroad grade parallels the river, lies closer to the river channel, and likely affects floodplain functions during routine peak flows. There are 4 railroad bridge crossings on the West Fork near Long Slim Creek and 2 railroad crossings in the headwaters of the West Fork. The are approximately 5 additional river crossings associated with private access roads, Forest Road #321, and Forest Road #765. The crossing associated with road #765 is a double culvert and a small sediment plug is forming at the inlet of one culvert. No river crossing has been identified as a fish barrier.

Bechtel Creek

Bechtel Creek is about 2.5 miles long. The upper 82% of the stream flows through NFS lands, the remainder (18%) at the mouth flows across private lands.

Beneficial uses in Bechtel Creek are "undesignated", which means criteria for cold-water aquatic life will apply, (Idaho Department of Health and Welfare 2000). This stream can be divided into three reaches. The lowest reach, is a deep trench type channel with a silty substrate. Riparian vegetation consists of grasses. There is an old culvert in this section, which is on an abandoned road. The railroad crosses Bechtel Creek in this reach. Between the railroad tracks and Highway 3 there is significant amounts of erosion caused by cattle grazing.

The second reach, located upstream of the highway crossing, is a DA6 Rosgen channel type. DA channel types are generally low gradient with multiple channels and are narrow and deep with expansive well vegetated floodplains and associated wetlands. There is very gentle relief with highly variable sinuosities. The streambanks in general are stable. This is true of this section of Bechtel Creek, which flows through a wide meadow. The main channel of Bechtel Creek averages 4' wide and 0.8' deep. The substrate is primarily silt and has patches of heavy aquatic plants and algae. This substrate composition is not conducive to salmonid spawning. Woody debris is primarily short, small diameter pieces.

The next reach upstream, approximately 1 mile upstream, is characterized as an E6 Rosgen channel type. This channel type describes a low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition. It is generally very efficient and stable. Bechtel Creek in this reach has narrowed to about 2-3' wide and has an average depth of 0.7'.

Woody debris increases in this reach, but continues to be dominated by small sized material. Larger sized pieces are however, starting to be represented. The riparian zone includes some conifers but also has old large stumps, which indicates riparian timber harvest, but is still dominated by grasses and ferns. The instream habitat is primarily run.

Temperature data was collected in Bechtel Creek in July 1998 and July 1999. Temperatures ranged from 10-15°C.

Cat Spur Creek

Cat Spur Creek is the largest subdrainage to the West Fork St. Maries in the project area. It is comprised of Cat Spur Creek, Log Creek, Kitten Creek, and several unnamed tributaries.

Cat Spur Creek is a 4th order tributary to the West Fork St. Maries River. Cat Spur Creek is a low gradient, meadow stream, which meanders through a well-developed floodplain for most of its length. Beneficial uses in Cat spur Creek are “undesignated”, which means criteria for cold-water aquatic life will apply, (Idaho Department of Health and Welfare 2000). Native westslope cutthroat trout utilize Cat Spur Creek for spawning, rearing, and over-wintering. Cat Spur Creek is identified in the Forest Plan as a high valued stream for fisheries resources.

Evaluations of the existing stream habitat conditions are based primarily on stream data collected in 1992 and field validation surveys in 1995 and 1996.

Four reaches of Cat Spur Creek totaling nearly 27,000 feet were inventoried for fish. Results of habitat surveys throughout the watershed indicate that Cat Spur Creek contains over 60% of the available rearing habitat for native salmonids in the Cat Spur Creek drainage. Runs and pools dominate aquatic habitat. Pool habitat is created primarily by; stream meanders, LWD, and beavers. Rootwads and beavers form the largest pools. Other habitats such as riffles, glides, and braids are represented and provide adequate habitat diversity. These conditions reflect the importance of Cat Spur Creek to the fishery in this watershed and beyond.

The distribution of sediment along Cat Spur Creek indicates that most of the salmonid spawning occurs in the upper reaches where substrate composition is more conducive to successful spawning. Substrate surveys reveal that the particle size distribution shifts from larger to smaller size material from the headwaters toward the mouth. Cobble, gravel, and sand predominate in the upper reaches of the stream. Gravel, sand, and fines are the dominant substrates in the lower 3 reaches of the stream. Substrate embeddedness surveys in pool tailouts (areas typically selected for spawning) show a trend of high to low gravel embeddedness in the direction of the headwaters and offers additional evidence that successful spawning most likely occurs in reaches 3, 4, and upstream.

Although Cat Spur Creek provides important habitat for native salmonids within the watershed, the quality of the habitat is impaired. Aquatic habitat in Cat Spur Creek lacks the complexity usually associated with quality habitat. Over 90% of the pools in Cat Spur Creek received below average ratings for cover complexity. Habitat data shows total stream cover to be low. Structural cover components such as woody debris and undercut banks are considered more beneficial to the carrying capacity of native salmonids than non-structural components such as algae and whitewater. Structural cover elements are weakly represented in Cat Spur Creek. Algae, low overhead cover, and whitewater make up the majority of the available stream cover. The lack of structural cover in

Cat Spur Creek is indicative of streams in non-forested areas. The abundance of algae in Cat Spur Creek is likely the result of nutrient inputs from cattle grazing and the amount of direct sunlight reaching the stream.

Pool habitat is under-developed as pool depths and volumes are relatively low for the size of Cat Spur Creek. Several factors likely contribute to the lack of pool development in this stream. Historical influences in the watershed have precipitated conditions in Cat Spur Creek that continue to work through the system. Current stresses from recent and on-going activity are complicating the ability of the stream to fully recover.

Sediment input is one factor that continues to degrade the quality of aquatic habitat in Cat Spur Creek. Cat Spur Creek is particularly sensitive to sediment production due to the energy poor hydrologic conditions inherent to its channel morphology. Stream channels that exhibit low gradient and high sinuosity like Cat Spur Creek are inefficient at routing sediment through the system. Excessive sediment delivery to these types of channels often result in deposition and a loss of pool capacity for rearing fish. Flood damage to roads in the Cat Spur Creek drainage in 1996 increased sedimentation and exacerbated this process in Cat Spur Creek.

The riparian conditions and activities along Cat Spur Creek are also influencing the quality of the aquatic habitat. Riparian stands of red cedar were cleared from the lower portion of the drainage prior to the 1930's. Cattle grazing along Cat Spur Creek perpetuate this condition today.

Channel stability is compromised in these areas resulting in bank sloughing and sediment production to the stream. The lack of trees in the riparian is also influencing stream shade and LWD recruitment. The scarcity of LWD in the stream is affecting habitat complexity. Road #361, pioneered in the 1930's, extends along the north side of Cat Spur Creek for approximately 1.6 miles of the 5 miles of stream length. This road reduces the productive potential of the riparian area, aids access to riparian areas for grazing cattle, and contributes sediment to Cat Spur Creek.

The proposed activity associated to the prospecting permit application (ID 33036) would be associated primarily to an ephemeral draw to Cat Spur Creek.

Hidden Creek

Hidden Creek is about 3.25 miles long and flows primarily through Forest Service lands, 93% of the stream length. A small portion at the confluence with the West Fork of the St. Maries River flows through Potlatch timber company lands and a small portion near the middle of the length flows through private lands. Beneficial uses in Hidden Creek are “undesignated”, which means criteria for cold-water aquatic life will apply, (Idaho Department of Health and Welfare 2000). Road 498 parallels the stream for the majority of its length. The road is within the RHCA for approximately 2.5 miles and encroaches on the stream itself for about 0.4 miles, (based on GIS mapping). Streamside roads have negative impacts to instream conditions. There are five road crossings and one railroad bridge on Hidden Creek. The road crossing nearest the confluence is a cement culvert; the remainder are metal culverts. The water resources report further discusses the influence of these culverts on the channel.

In 1998 a quantitative habitat survey was conducted on the lowest reach, 3544' of Hidden Creek. Because this survey was conducted on only the lower 20% of the stream it is very likely the habitat conditions changed as the stream increased gradient and moved into more timbered areas. This evaluation of the existing stream habitat conditions, is however, based primarily on this stream survey data. The reach was classified as an E6 Rosgen channel type. This channel type describes a low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition. The reach averages 8' wide and 0.9' depth. This survey identified that the majority of the habitat, 78.1%, was run habitat. Pool habitat was the next most common at 18.4%, which equates to approximately 9 pools/1000'. InFish lists interim objectives for pool frequency within streams which are 10' wide as 18 pools/1000'. The majority of pool habitat (64%) is created by meanders, which is indicative of this channel type. Glide and braided habitat were also represented but collectively only comprised 3.5% of the habitat. This represents very low habitat diversity.

Cover complexity in this reach is very low. Almost all of the pools (94%) have below average cover complexity. Which means there is very little space within the pool for fish to hide. Throughout the reach not only is cover lacking, but the quality of the cover is poor. The majority of the cover within the reach is provided by non-structural cover (i.e. aquatic vegetation and overhanging terrestrial vegetation), which is not as beneficial for fish.

Substrate composition consists primarily of sands and fines, with a very limited amount of gravel. This composition is not conducive to westslope cutthroat or bull trout spawning.

The stream survey identified an average of 130.6 pieces of woody debris per 1000' within reach 1. The majority of woody debris is small diameter, short pieces (88%). Only 1.4 pieces/1000' (1%) of the woody debris fits into the definition of large woody debris (LWD) specified in InFish.

Stream temperatures were recorded continuously from May 2000 until October 2000. Temperatures ranged from 2-16.6°C (see project file). These temperatures are within Idaho State standards.

Wood Creek

Wood Creek is about three miles long and flows primarily through Forest Service lands, 97%, with only a small portion on Potlatch Timber Corporation and Idaho State lands near the mouth. Beneficial uses in Wood Creek are "undesignated", which means criteria for cold-water aquatic life will apply, (Idaho Department of Health and Welfare 2000).

The following stream habitat characterization is based on qualitative field reviews of Wood Creek. Between the confluence with the West Fork of the St. Maries River and the crossing of Road 765, Wood Creek is an E6 channel type. The stream flows through a low gradient valley with a wide floodplain. The stream banks are very stable and well vegetated. The stream averages about 3' wide. Stream depth ranges from .2" in the riffle habitat to 2.5' in the deepest part of some pools. The habitat is about 50% run, 40% pool and 10% riffle. Pool habitat is created primarily by meanders. Pool habitat is sufficient to provide habitat for adult fish. Run habitat is providing excellent rearing habitat. The substrate is primarily silt/sand, which is not conducive to salmonid spawning. Riparian alder and other brush provide a

dense cover over the majority of the lower reach of the stream. Other instream cover is provided by; undercut banks and woody debris.

The stream crossing on Road 765 is a concrete culvert and appears to be functioning appropriately.

The culvert under Highway 3 is not a migration barrier but the culvert under Forest Service road 341 is a low flow migration barrier due to a vertical jump. Upstream of Highway 3 the channel continues to be an E channel type.

The riparian zone is primarily grasses and forbs. Road 341 parallels the channel for the length of the road. Approximately 90% of the road is within 100' of the channel and approximately 20% is within 25' of the channel. Roads directly affect natural sediment and hydrologic regimes by altering streamflow, sediment loading, sediment transport and deposition, channel morphology, channel stability, substrate composition, stream temperatures, water quality and riparian conditions (Lee et al. 1997). Valley bottom roads, such as occurs along Wood Creek, are likely to be the most impactive road segments (Dose and Roper 1994). Such habitat alterations can adversely affect all life-stages of fishes, including migration, spawning, incubation, emergence, and rearing (Furniss et al 1991).

Temperature data was recorded continuously from May 2000 until October 2000. Temperatures ranged from 2-14°C (see project file). These are within Idaho State Standards.

Environmental Consequences

Alternative Analysis Methodology:

This analysis is based on an assessment of possible changes to the specific issue indicators which will likely be affected by this proposal. The list of potential issue indicators displayed in Table 3-3 were developed by the U.S. Fish and Wildlife Service for the bull trout consultation matrix. These issue indicators were used as a prompt to ensure that all issues were considered before the most pertinent were selected for use in the analysis of the alternatives. As identified by Table 3-3 there are many factors frequently discussed for streams but the majority of these will not be analyzed for this project because they would not be influenced by the implementation of an alternative, are not the primary limiting factors for fish production, or can be correlated to the determination of effects for other factors, which are analyzed. The latter is true for the effects analysis of recreational fishing (both economics and experience) as it relates to Executive Order 12962. Bisson and Sedell (1982) established the relationship between fish populations and aquatic habitat degradation. They determined that the viability of fish populations can be negatively affected by aquatic habitat degradation. The size of the fish population effects the amount of recreational fishing which occurs. Based on the above relationship it can be assumed that if the habitat is degraded, there is a negative effect to fish population viability, which in turn can produce a reduction in recreational fishing, which in turn would have a negative effect on the recreational fishing industry. Therefore the degradation of habitat would have a negative effect on the recreational fishing. Because of this relationship effects to habitat will be used as a surrogate to determine the potential for effects to the recreational fishing industry.

Another issue, which could be discussed is temperature, because temperature is an issue in some of the streams of the project area. However, because of the existing condition, (limited stream shading), the lack of the potential to reach lethal temperatures and because riparian zone vegetation is an issue discussed, temperature will not be discussed further.

Table 3-3 - Fisheries Issue Indicators

Issue Indicator	Measurement Method
Population Characteristics	Population size, growth and survival, diversity, isolation, persistence
Watershed Condition	Road density, riparian harvest, activity on sensitive landtypes, and activity within the ROS elevation
Water Quality	Temperature, Sediment, Chemical Contaminants/nutrients
Habitat Access	Physical barriers
Habitat Elements	Substrate embeddedness, large woody debris, pool frequency, large pools, off channel habitat, refugia
Stream channel conditions	Width to depth ratio, streambank condition, floodplain connectivity
Flow/hydrology	Change in Peak/base flows

The effects analysis will focus on the anticipated affects of each alternative on the issues, which were derived from the identification of the limiting factors. Based on the fact that low carrying capacity and low overwintering survival are both limiting fish production in the Stars and Sands area, the issue indicators are:

1) amount of riparian habitat removed

2) amount of channel altered and

3) increase in sediment.

These issue indicators relate to overwintering habitat because it is influenced by the condition of the riparian zone and by the condition of the streambanks. Large woody debris is a critical element for aquatic habitat diversity and complexity (Reeves et al. 1993). Overwintering habitat (pools) is often created by large woody debris, which also provides cover and adds complexity to habitats; this increases habitat suitability. Riparian activity influences the potential to recruit large woody debris to streams (Sedell et al. 1988). By altering the recruitment potential for large woody debris, riparian activity can alter the composition, diversity, and structural complexity of aquatic habitat (Bisson et al. 1987, Hicks 1990, Bilby and Ward 1991). Riparian conditions are considered during the analysis of effects to the fishery of the project area.

Overwintering habitat is also influenced by condition of the streambanks. If streambanks erode excessively the increased input of sediment to the stream can cause the filling of pool habitat and the flattening of riffles (Gordon et al 1992). Bisson and Sedell (1982) reported that where stream channels had become destabilized, riffles elongated and in many cases extended through former pool locations resulting in a loss of pool volume and effectiveness of large, stable debris as cover. They suggested that declines in older fish may have resulted due to their dependence upon deeper water habitat. The erosion of streambanks also effects the shape of the channel. The erosion of weak banks of gravel or other unconsolidated

alluvium, collapse easily, forming wide, shallow channels whereas banks of more cohesive materials form deep, narrow ones (Gordon et al 1992). The amount of riparian vegetation also influences the stability of the banks, the greater the density of the vegetation and the type of vegetation the more stable the banks.

This analysis will relate the proposed activities to the existing condition of the streams in the project area and determine what the effects will be to the issue indicators. The existing conditions are a result of the past human caused and natural activity in the drainages. Past activity is described under the heading historical influences, in the fisheries section, as well as a listing of past activity, which is provided in the project file. Future foreseeable actions will also be considered into the effects analysis and are listed in Chapter 3 of this document.

The cumulative effects area for this project is defined as the St. Maries River at the confluence with Emerald Creek but excludes the Middle Fork St. Maries River. This are was selected for the fisheries resource because it contains all potential project activities and defines the largest watershed area that allows for the greatest level of resolution for determining a project's contribution to cumulative effects operating at various geographic scales.

Common to All Alternatives

Cumulative Effects

The following activities are common to the no action alternative (Alternative A) and the two action alternatives (Alternatives B and C).

On Going Federal Activity

Noxious Weeds

Treatments planned to occur within the St. Joe drainage, which includes the Stars and Sands project area, were analyzed in the St. Joe Weed Control Project EIS.

The Stars and Sands EIS will tier to the St. Joe Weed Control Project EIS (1999) for the determination of effects of the proposed treatment methods on the aquatic environment and biota. The analysis provided in the Weed Control EIS determined that there would be no significant impact on the fisheries from the proposed treatments (project file, St. Joe Weed Control Project EIS, pages IV 12-18).

Dutch Cat Timber Sales

The effects from activity proposed in the Dutch Cat EA were analyzed regarding fisheries concerns. The following summarizes that analysis, the detailed analysis is located in project file document: Dutch Cat Environmental Assessment 1997, page IV 19-21.

No direct effects would be anticipated on the fisheries resources as a result of this alternative due to the designation of stream buffers.

Indirect effects on the fisheries resources would be primarily associated with the effects to the watershed processes in each sub-basin as a result of Federal activities proposed in the

selected alternative. The fisheries resource would experience temporary degradation from increased sediment due to road construction, reconstruction (1.75 miles) and obliteration (9.9 miles). In the long term there would be reduced sediment, beyond existing condition. The indirect effects of water yield and peak flow in Cat Spur Creek would not be influenced by the Forest Service proposed action but would continue to be influenced by roads constricting the floodplain and cattle grazing.

<u>Cumulative Effects:</u> short-term risks are associated with the selected alternative but long-term expectations for the fisheries resource are more favorable than those of the existing condition.

Power-line clearing and maintenance

BPA and Clearwater Power have powerlines that pass through the southeast portion of the project area; Cat Spur Creek drainage. Maintenance which effects the surrounding environment includes removal of trees and shrubs growing under the lines, clearing the roads leading to the towers and herbicide use. The Right of Way under the powerlines is 150' wide, danger trees may be removed up to 125' on either side of the powerline right-of-way. The agreement between the Forest Service and BPA is located in the project file.

Clearing under the powerlines should have little impact on the aquatic condition. Trees felled are left on the ground, which create woody debris for the streams or sediment collectors on the hillslopes. If any trees are felled within the RHCA, there should be little if any influence on stream shading or temperature because of the narrow width of the corridor. Reduction in potential for large woody debris recruitment will also be minimally affected because of the narrow width of the corridor. Herbicide use would have to comply with the guidelines describe in the St. Joe noxious weed EIS.

Outfitter and Guides

The Stars and Sands project area is within the boundaries of two hunting outfitters, the Idaho Whitetail Guides and Shattuck Creek Camps Outfitter/Guide. The project area also encompasses the Emerald Creek Garnet Area Outfitter permit. This outfitter guides clients on garnet digging excursions. The regulation of these activities is guided by the individual Forest Service Outfitter Guide permit. These permits specify the activity, timing and duration, which are allowed.

The hunting outfitter activity is not expected to influence the fishery in the project area because the activity will not affect instream habitat. Incidental fishing, which can occur under these permits, is regulated by Idaho State Fishing regulations. The effects of the Emerald Creek Garnet Area Outfitter activity is considered along with the effects of the general garnet digging, which has been authorized in 281 Gulch.

<u>On Going Activity, Which Occurs On Both Federal And Non-Federal Lands</u>

Fire suppression

Fires ignited naturally or human caused will be suppressed within the project area.

InFish provides guidance on how to protect aquatic and riparian concerns during fire suppression activities on Forest Service managed land. Adherence to these guidelines will reduce impacts to the fish population (Project file, InFish).

Recreational uses

Hunting, fishing, camping, sightseeing, and pleasure driving of automobiles and ATV's, will continue in this area regardless of the alternative selected. Fishing can have a direct impact on the fish population of the area.

This activity is regulated by the State of Idaho Fishing regulations, which for this area are under the wild trout management regulations. In general, this allows limited harvest of resident cutthroat trout and liberal harvest of brook trout. Other recreational activities mainly affect (indirect) the aquatic habitat and the fish population through the use of the road system of the area. The influence of roads was previously discussed in the existing condition, historical influences section, and will be considered during cumulative effects analysis.

Miscellaneous gathering of forest products

Firewood, huckleberries, mushrooms, etc are available within the project area.

The collection of these products mainly affects the aquatic habitat and the fish population by the use of the roads that people drive on to access these activities. Effects of roads on the streams of the project area have been described in the existing condition, historical influences section of this document. These effects will continue regardless of the alternative selected. Road effects will be taken into consideration during cumulative effects analysis.

Cattle grazing

Grazing will continue to occur across mixed ownership (including National Forest System land) within the cumulative effects area.

Grazing can dramatically alter the physical and biological components of streams and their riparian habitats (Platts 1991). Grazing affects sensitive riparian areas, which in turn will affect instream conditions. In Meehan (1991) it is stated that "Generally, in grazed areas, stream channels contain more fine sediment, streambanks are more unstable, banks are less undercut, and summer water temperatures are higher than is the case for streams in ungrazed areas." Grazing on private lands is expected to continue in a manner similar to what has occurred in the past, which will maintain the streams in their current condition. **Grazing** on Federally managed land could be modified in the foreseeable future based on decisions made in the St. Maries Grazing Allotments EA. The Stars and Sands EIS will incorporate the activity from the *proposed* action of the St. Maries Grazing Allotments EA into this cumulative effects analysis. The Stars and Sands EIS is however not making a decision on the actual final decision of the Allotment EA. Grazing allotments addressed in that EA, which are also part of the Stars and Sands EIS are: Cat Spur Grazing Allotment (Cat Spur Creek and Kitten Creek), Merry Creek Allotment (a portion of the lower St. Maries River) and Emerald Creek Allotment (Emerald Creek and its tributaries, and a portion of the lower St. Maries River). The proposed action for the St. Maries Grazing EA does not change the number of cattle allowed on the allotments nor does it change the grazing season. The

change from the existing condition includes changes to the grazing system, utilization standards and how the Range Boss is used.

Even though the number of cattle and season of use are the same as what is maintaining a degraded system, the implementation of the utilization standards should reduce grazing effects on the streams by protecting the vegetative cover of the banks and the streambanks themselves. Some improvements, such as riparian fencing, should occur which will also protect the streambanks and thus reduce the amount of sediment entering the streams.

Unregulated mining

Unregulated mining will continue to occur irrespective of the alternative selected. Unregulated mining activity has occurred in the past and can be expected to occur in the future. This activity can occur in the stream channels or in areas outside of the RHCA. Within the Stars and Sands area most of the streams have had some level of disturbance caused by unregulated mining.

This activity has a negative effect on fish populations due to the digging within the stream channel which puts sediment into suspension, degrades or eliminates overwintering habitat, degrades channel integrity and depending on the time of the activity could disturb eggs within the stream substrate. There is no rehabilitation associated to this mining, which delays the recovery from the mining activity. Although the effects are negative to the fishery the activity does not occur often and is usually on a small scale. If however, the Forest Service managed activity was stopped it can be assumed that there would be a greater amount of unregulated mining (see Recreation section of this document) and thus great impacts to the fishery. The effects of mining will be considered during the analysis of cumulative effects.

Operation and maintenance of non-FS or joint transportation systems

The Stars and Sands area has a mix of transportation types and ownerships including: Railroad, State Highway, County roads, cost share roads, utilities access and private roads.

The maintenance of these roads systems must comply with State Standards. These standards reduce the amount of sediment, which is generated by these various transportation systems, but on average small amounts of sediment will be created. This sediment would create water quality related effects to the channel. The Water Resources Report states, "it is not expected to be cumulatively significant because effects are temporary."

Biotic Factors

Biotic factors within the project area, which affect native populations, primarily refers to the presence of brook trout within many of the streams. As mentioned in the existing condition, brook trout are not a native species to these streams but have been introduced and are increasing in number and distribution. Rieman and McIntyre (1993) report that the elimination or isolation of different life-history forms, predation, *competition, or hybridization with exotic species*, and increased variation of populations dynamics are critical mechanisms leading to population declines or extinction. Some of these mechanisms, particularly isolation of life history forms, and competition and hybridization with exotic fish species, are affecting native trout populations within the analysis area.

Predation, competition, and hybridization, due to the presence of brook trout, are not expected to be altered by any alternative and will continue to have a negative impact on the native population.

On Going Non-Federal Activity

Non-federal timber management practices will occur on State and private lands independent of the alternative selected for this project

Road construction is often associated with increased risks for accelerated sediment production, altered watershed hydrology, and reduced stream shading and large woody debris recruitment. These risks can produce negative changes to instream conditions including channel stability, pool abundance and quality, stream temperatures, and cover complexity which could adversely affect native trout populations (Rieman and McIntyre 1993, Moore and Gregory 1989, Bisson and Sedell 1982). It is uncertain to what extent future activities would occur on private land within the cumulative effects area and therefore the magnitude of effects is speculative. Road construction and timber harvest that occurs on private and Idaho State lands must comply with Idaho Forest Practices and the Clean Water Act at a minimum. Compliance with this direction helps reduce the risk for increased sedimentation and changes to channel conditions but it does not completely eliminate risks to aquatic resources associated with these activities. The risk of negative effects to the aquatic resources increases with an increase in the magnitude of activity and decreases with the amount of restoration implemented. If future activity on private land, within the drainages of the project area, is consistent with past activity, a long term projection of negative cumulative effects to aquatic resources in the St. Maries drainage would be expected. This determination is based on the observation that activities on these non-federal lands often construct large amounts of road which are closed to public traffic but which are not rehabilitated due to continued re-entry into the area. Potential effects of timber management on State and private lands are considered in the cumulative effects analysis for each alternative.

Clarkia community and associated business activity (Fossil Bowl, RR, landing, work center, etc.)

The effects of these activities vary greatly depending on the specific activity being addressed. The primary effect of these activities on the fisheries is the potential to increase sediment to the streams. The increase in sediment can decrease overwintering habitat, can reduce potential spawning sites and can negatively effect the survival of eggs. These activities will continue to occur regardless of the alternative selected for this project and will be considered as such for the cumulative effects analysis.

Future Foreseeable Forest Service Actions

Hidden Cedar Timber Sales, etc.

The Hidden Cedar Project DEIS (5/2001) proposed action is located within the Stars and Sands project area. Effects from the proposed action would influence the following streams in the Stars and Sands project area; Bechtel, Cat Spur, Hidden, Wood, West Fork St. Maries and the portion of the St. Maries River upstream of Emerald Creek. The current condition for

Bechtel, Cat Spur, Hidden and Wood Creeks are "functioning at risk". The current condition for West Fork St. Maries, and the portion of the St. Maries River in the project area is "not functioning properly". The implementation of the Hidden Cedar proposed action would not alter the current condition of those streams.

Direct and Indirect Effects

Common to All Action Alternatives

Test Trenches

Effects on Riparian Vegetation: These test trenches will have a effect on the stream shading on the stream depending on the type of riparian vegetation effected, the orientation of the trenching to the stream and the length of trenching. Few, if any, trees will be cut. If there are any trees cut they will be left on the site to intercept any sediment movement and if they fall across or into the stream they will provide instream fish habitat. In general the effects should be minimal due to the limited area which would be affected.

Effects on Stream Channels: Test trenches will not be dug into the stream channel or stream banks, but will be dug within the riparian zone, therefore there will be no disturbance of the stream channels.

Effects on Sediment: Increased sedimentation to the stream from the digging of the trenches is unlikely due to the location of the trenches, and because the holes/trenches will be refilled immediately, seeded and mulched.

Rehabilitation of Affected Channel

Effects on Riparian Vegetation: Riparian planting will increase the rate of recovery of the riparian zone.

Effects on Stream Channel: Large Woody debris will be added to the stream channel which will bring back overwintering habitat (pools).

Effects on Sediment: The use of a suction dredge (Design Features, Chapter 2) to remove sediment from settling ponds will reduce the amount of sediment which can fill the pool habitat.

Analysis By Drainage

The following tables, displayed for each stream, indicate the on-going and proposed activities for federal and non-federal lands, which are considered during the cumulative effects analysis for each individual drainage.

281 Gulch, No Name Gulch and Pee Wee Gulch

These three drainages are being presented together because they have similar past histories, are similar in size, are similar in current condition, and have similar proposed activity.

Table 3-4 - Activities Analyzed

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Test Trenches	na	Y	Y
	Potential Development – Recreational Garnet Gemstone Extraction	na	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Unregulated garnet mining	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y

Direct and Indirect Effects

Alternative A

Under the no action alternative there would be no proposed activity occurring in this drainage.

Effects to Riparian Vegetation: The vegetation in the riparian zone would continue to grow and in the long term would achieve a height which would aid in the shading of the stream which in turn would reduce and regulate stream temperatures. The conifers in the riparian zone would also eventually have the potential for becoming recruitment woody debris for the stream. The streambanks would further stabilize as the riparian vegetation increases and grows.

Effects to Sediment: There would be no increases in sediment due to the lack of activity. Sediment inputs would come from the natural processes on channel development and would come from the road associated to this stream.

Effects to Stream Channel: The amount of undercut banks would increase, the amount and quality of pool habitat would increase.

Alternative B and C:

These alternatives have the same activities proposed for these drainages so the effects will be the same.

The proposed activities will have direct and indirect effects on aquatic habitat in the project area. These effects are expected as a result of removing riparian vegetation to prepare the areas for digging, excavating in stream channels and flood plains to prepare areas for public digging, dewatering sections of stream to reduce sediment production during the operation, and reconstructing or constructing dams for sediment settling ponds. The timing of these activities can also influence the degree that the fisheries resources will be affected.

Effects to Riparian Vegetation: Removing brush and trees at the dig sites within riparian habitat conservation areas (RHCA's) as defined in the Inland Native Fish Strategy (INFish)

(USDA Forest Service 1995) can have several adverse effects to the aquatic environment. Riparian vegetation is an important component of stream shading which helps protect stream temperatures from reaching stressful levels for coldwater biota.

Riparian vegetation also contributes to the stability of stream channels. Root mass from streamside vegetation helps hold soil particles together and offers resistance against the erosive energy of streams on their banks. In addition, vegetative stems, leaf litter, and tree trunks offer friction elements that can decrease the erosive energy of out-of-bank flows and increase soil stability in flood prone areas. The stability of soils in the flood plain can influence the rate of channel migration and therefore effect the stability of stream channels. Removing riparian vegetation would likely increase sediment production and reduce channel stability.

The removal of streamside vegetation would also reduce the contribution of terrestrial vegetation to in-stream cover for fish inhabitants. Removing trees within the riparian will affect the future recruitment potential for large woody debris to the channel. Large woody debris is instrumental in developing and maintaining important components of fish habitat such as pools and cover complexity. Removal of streamside brush can also reduce overhead cover as well as in-stream cover because brush limbs often hang in the water or close to the water surface.

Returning soils in the proper soil layer sequence to improve the potential for success of revegatating the area and planting trees and shrubs within the riparian zone during the rehabilitation will reduce the impact of this mining on the contribution of the riparian vegetation to the stream environment.

Effects of Sediment: Excavating the stream channel and flood plain of a stream for the purpose of garnet gemstone extraction will increase sediment production and disrupt channel equilibrium. The increase in sediment can degrade the quantity and quality of spawning and rearing habitat for native salmonids. The timing of excavation can also influence the extent that the physical and biological components are affected.

Effects from excavating in fish-bearing reaches are minimized by delaying this operation until lower flow periods of summer and after fry emergence have been achieved. The effect will also be somewhat reduced through the installation of woody debris structures and planting of vegetation on the new stream bank, but it will be several years before it becomes stable. Another means of minimizing effects is to implement the design criteria, which requires that all areas be rehabilitated in the fall to a condition that prepares it to handle the next year's spring run-off thus minimizing the potential for erosion. Careful rehabilitation of disturbed sites can encourage recovery and help reduce the long-term impact of this activity on the aquatic environment.

Effects to Stream Channels: There is, approximately 2600' of fish habitat in Pee Wee Creek and 1,300' in No Name Creek, which are included in the 1 mile length of stream which is proposed for garnet gemstone mining. Mining for garnet gemstones eliminates instream fish habitat within the section that is being mined. Undercut banks are an important source of hiding cover. Undercut banks will not be restored during rehabilitation but will overtime be developed as vegetation becomes established and the channel begins to stabilize.

There are several design criteria that were developed to help minimize the effects of the mining on the stream channels. Limiting the mining to average 200-300' of disturbed stream per year will ensure that there remains some sections of stream downstream of the project which are still suitable habitat. However as the mining progresses downstream the amount of undisturbed area becomes reduced each year. Rehabilitated areas upstream of the active mining site will slowly recover and may become useful as the mining area moves downstream. Rehabilitation of the site will be completed prior to fall. The rehabilitation includes the placement of trees, which had been cut to facilitate the mining, into the stream channel. This return of woody debris to the channel reduces some of the impacts created by the mining.

Cumulative Effects

Alternative A

The streams would continue to slowly improve and become higher quality fish habitat than they currently are. If however, unregulated mining would increase in these streams they would become further degraded because of the lack of rehabilitation, which occurs with unregulated mining.

Alternatives B and C

Cumulative effects on the fisheries resources where recreational garnet digging is being proposed include prior timber harvesting in the head waters, prior road building, and prior garnet digging operations in and along the stream. The combination of effects from past land management activities and the direct and indirect effects from continued garnet digging operations will further degrade stream resources. This suggests that continuing the garnet digging operation is inconsistent with the purpose of INFish. However, INFish recognizes the unique challenges of managing mineral resources while protecting aquatic environments. INFish standard MM-1 states "Minimize adverse effects to inland native fish species from mineral operations ... For operations in a Riparian Habitat Conservation Area ensure operators take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat which may be affected by the operations." Although fish habitat conditions are expected to be adversely impacted by cumulative effects, the garnet digging operation includes measures (woody debris placement, suction dredging) that help minimize impacts to aquatic resources (e.g. seasonal limitations and rehabilitation) and thereby address INFish standard MM-1. In addition by managing this activity rather than having unregulated mining occur, which is expected if the Forest Service activity is terminated, there is the requirement to rehabilitate the streams which would recover them to meet the riparian management objectives more quickly.

Strom Gulch:

Table 3-5 - Activities analyzed in Strom Gulch

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Test Trenches	na	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y

Ongoing FS and other	Noxious Weeds	Y	Y	Y
	Fire Suppression	Y	Y	Y
	Unregulated mining	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y

Direct and Indirect Effects

Alternative A:

Under the no action alternative there would be no proposed activity occurring in this drainage.

Effects to Riparian Vegetation: There would be no effect to the riparian vegetation. The vegetation would contain to grow and supply a continuous amount of woody debris to the stream.

Effects to Sediment: There will be no increase in sediment.

Effects to Stream Channel: There will be no alteration of the stream channel.

Alternatives B and C

Strom Gulch is not a fisheries stream.

The effects from the test trenching were presented in the section titled Effects Common to All Action Alternatives.

Cumulative Effects

Alternative A

There will no effects from the selection of this alternative, the existing condition would continue. There is evidence that unregulated mining had occurred in this drainage but it is very old, (Best, personal communication). Because the occurrence is in the distant past, unregulated mining is assumed to have a very low probability of reoccurring in this drainage and therefore will not add to the cumulative effects.

Alternatives B and C

Because this stream is not a fisheries stream the effects of activity here will deal with the effects to water quality. Please see the Watershed report for a description of the effects to water quality.

East Fork Emerald Creek

Table 3-6 - Activities analyzed for East Fork Emerald Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Bechtel Butte Lease Application	N	Y	Y
	Bechtel Butte Prospecting Permit - Test Trenches	N	Y	Y

	East Fork Emerald Prospecting Permit – Test Trenches	N	Y	Y
Potential Development	East Fork Emerald - Leasing and commercial mining of garnet sands	N	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Unregulated mining	Y	Y	Y
	Recreation Use	Y	Y	Y
	Grazing	Y	Y	Y
	Private Road construction (known)	Y	Y	Y
Ongoing	Brook Trout present	Y	Y	Y

Direct and Indirect Effects

Alternative A

Under the no action alternative there would be no proposed activity occurring in this drainage.

Effects to Riparian Vegetation : The vegetation in the riparian zone would continue to grow and in the long term would achieve a height which would aid in the shading of the stream and which in turn would reduce and regulate stream temperatures. The conifers in the riparian zone would also eventually have the potential for becoming recruitment woody debris for the stream. This would be a continuous process because of the different times which trees become established.

Effects to Sediment: There would be no increases in sediment due to the lack of activity. Sediment inputs would come from the natural processes on channel development and would come from the road associated to this stream.

Effects to Stream Channel: The streambanks would further stabilize as the riparian vegetation increases and grows. The amount of undercut banks would increase. Pool habitat should increase in quality over time.

Alternative B

The analysis of Alternative B includes the potential development activities described in Chapter 2.

The lease application and the prospecting permit application for mining on Bechtel Butte are located in the East Fork Emerald Creek drainage, near the ridge between the Emerald Creek drainage and the Wood Creek drainage. There is no flowing water within the current proposed mining area for the Bechtel Butte lease and prospecting permit applications, therefore there will be no effect to the fisheries if this proposal is implemented.

There will be two test trenches dug in the East Fork Emerald Creek drainage. The effects from this activity were described in the section titled Effects Common to All Action Alternatives.

The activities associated to the potential development of the garnet sands mining operation would have a variety of associated impacts to the stream. A detailed description of this potential development and the subsequent rehabilitation will be submitted in a subsequent NEPA document which will be based on the plan of operation. Lacking the specifics of that plan, the following is an assumption of what the project will include. based on current information

Effects to Riparian Vegetation: Removing brush and trees at the dig sites within riparian habitat conservation areas (RHCA's) as defined in the Inland Native Fish Strategy (INFish) (USDA Forest Service 1995) can have several adverse effects to the aquatic environment. Riparian vegetation is an important component of stream shading which helps protect stream temperatures from reaching stressful levels for coldwater biota. The East Fork of Emerald currently has higher stream temperatures than that desired for salmonids.

Riparian vegetation also contributes to the stability of stream channels. Root mass from streamside vegetation helps hold soil particles together and offers resistance against the erosive energy of streams on their banks. In addition, vegetative stems, leaf litter, and tree trunks offer friction elements that can decrease the erosive energy of out-of-bank flows and increase soil stability in flood prone areas. The stability of soils in the flood plain can influence the rate of channel migration and therefore effect the stability of stream channels. Removing riparian vegetation would likely increase sediment production and reduce channel stability.

The removal of streamside vegetation would also reduce the contribution of terrestrial vegetation to in-stream cover for fish inhabitants. Removing trees within the riparian will affect the future recruitment potential for large woody debris to the channel. Large woody debris is instrumental in developing and maintaining important components of fish habitat such as pools and cover complexity. Retaining trees that are cut within the riparian to use during rehabilitation efforts will reduce the impact of this practice on future woody debris densities. Removal of streamside brush can also reduce overhead cover as well as in-stream cover because brush limbs often hang in the water or close to the water surface.

There are ten sections, approximately 10,000', which are proposed for garnet sand extraction. Seven of these sites currently have grasses, forbs and brush as the dominant vegetation and therefore riparian vegetation is contributing very little to the temperature regulation of the stream or recruitment of large woody debris. In these sections shading is occurring primarily due to the orientation of the stream channel to the hillslopes. This vegetation is contributing root mass to increase the stability of streambanks. The remaining three sections (the lower most) do include trees within the floodplain which are within 50' of the stream. The removal of timber in these sections would have a negative impact on the potential for the natural recruitment of large woody debris. However the implementation of Idaho State Mining BMP's, which requires the installation of woody debris in altered stream channels, and the planting of conifers, will ensure that some woody debris is placed in the streams and that when the seedlings grow up they will become future woody debris. There will likely be a period of time in the future when the woody debris which was installed begins to rot out but the seedlings have not reached sufficient height to replace it. Based on this information it is predicted that stream temperatures are not expected to approach lethal levels

for native salmonids as a result of the garnet digging operation and that the potential loss of LWD recruitment can be lessened.

Effects of Sediment: Excavating the stream channel and flood plain of a stream for the purpose of garnet sand extraction will increase sediment production and disrupt channel equilibrium. The increase in sediment can degrade the quantity and quality of spawning and rearing habitat for native salmonids. The timing of excavation can also influence the extent that the physical and biological components are affected. Effects from excavating in fish-bearing reaches are minimized by delaying this operation until lower flow periods of summer and after fry emergence have been achieved. Another means of minimizing effects is to implement the design criteria which requires that all areas be rehabilitated in the fall to a condition that prepares it to handle the next year's spring run-off thus minimizing the potential for erosion. Careful rehabilitation of disturbed sites can encourage recovery and help reduce the long-term impact of this activity on the aquatic environment.

Relocating a stream channel changes a stream with natural armouring and undercut banks into a channel which lacks bank and streambottom stability with the stream being routed over freshly deposited sand and gravel. There are also no undercut banks in a newly created stream channel. Undercut banks are an important source of hiding cover. The effect will be somewhat reduced through the implementation of Idaho State Mining BMPs which identifies the procedure for the design of the new channel, and the timing for shifting the stream to the new channel before the initiation of excavation in the original channel. The installation of woody debris structures and planting of vegetation on the new stream bank will reduce the negative effects of shifting an established stream to a new location, but it will be several years before it becomes stable.

Effects to Stream Channel: Relocating a stream channel alters the amount, type and stability of habitat within the channel. The construction of the new channel must meet with certain criteria before the water can be shifted. The implementation of Idaho State Mining BMP's would reduce the negative effects of shifting the stream by ensuring that the new stream is designed properly, includes woody debris for cover and the creation of overwintering habitat. The amount of undercut banks, which are an important source of hiding cover, would be lost in the new stream, although in the long term they would eventually reestablish.

Alternative C

The lease application and the prospecting permit application for mining on Bechtel Butte are located in the East Fork Emerald Creek drainage, near the ridge between the Emerald Creek drainage and the Wood Creek drainage. There is no flowing water within the current proposed mining area for the Bechtel Butte lease and prospecting permit applications, therefore there will be no effect to the fisheries if this proposal is implemented.

There will be two test trenches dug in the East Fork Emerald Creek drainage. The effects from this activity were described in the section titled Effects Common to All Action Alternatives. The result is minimal if any effects.

The activities associated to the potential development of the garnet sands mining operation would have a variety of associated impacts to the stream. A detailed description of this potential development and the subsequent rehabilitation will be submitted in a subsequent

NEPA document, which will be based on the plan of operation. Lacking the specifics of that plan, the following is an assumption of what the project will include based on current information. For this alternative the main assumption is a 30' intact bufferstrip between the stream and the mining activity.

<u>Effects to Riparian Vegetation:</u> Removing brush and trees at the dig sites within riparian habitat conservation areas (RHCA's) as defined in the Inland Native Fish Strategy (INFish) (USDA Forest Service 1995) can have several adverse effects to the aquatic environment. Riparian vegetation is an important component of stream shading which helps protect stream temperatures from reaching stressful levels for coldwater biota. The East Fork of Emerald currently has higher stream temperatures than that desired for salmonids.

Riparian vegetation also contributes to the stability of stream channels. Root mass from streamside vegetation helps hold soil particles together and offers resistance against the erosive energy of streams on their banks. In addition, vegetative stems, leaf litter, and tree trunks offer friction elements that can decrease the erosive energy of out-of-bank flows and increase soil stability in flood prone areas. The stability of soils in the flood plain can influence the rate of channel migration and therefore effect the stability of stream channels. Removing riparian vegetation would likely increase sediment production and reduce channel stability.

The removal of streamside vegetation would also reduce the contribution of terrestrial vegetation to in-stream cover for fish inhabitants. Removing trees within the riparian will affect the future recruitment potential for large woody debris to the channel. Large woody debris is instrumental in developing and maintaining important components of fish habitat such as pools and cover complexity. Retaining trees that are cut within the riparian to use during rehabilitation efforts will reduce the impact of this practice on future woody debris densities. Removal of streamside brush can also reduce overhead cover as well as in-stream cover because brush limbs often hang in the water or close to the water surface.

There are ten sections, approximately 10,000 feet, which are proposed for garnet sand extraction. Seven of these sites currently have grasses, forbs and brush as the dominant vegetation and therefore riparian vegetation is contributing very little to the temperature regulation of the stream or recruitment of large woody debris. In these sections shading is occurring primarily due to the orientation of the stream channel to the hillslopes. This vegetation is contributing root mass to increase the stability of streambanks. The remaining three sections (the lower most) do include trees within the floodplain which are within 50' of the stream. The removal of timber in these sections would have a negative impact on the potential for the natural recruitment of large woody debris.

The implementation of Idaho State Mining BMP's, which requires the stockpiling of soils to ensure the soils will be return to maintain the appropriate soil profile, and the planting of conifers, will increase the probability for future woody debris recruitment when the seedlings grow up. There will likely be a period of time in the future when the current woody debris begins to rot out but the seedlings have not reached sufficient height to replace it. Based on this information it is predicted that stream temperatures are not expected to approach lethal levels for native salmonids as a result of the garnet digging operation and that the potential loss of LWD recruitment can be lessened.

Effects of Sediment: There will likely be insignificant amounts of sediment introduced to the channel due to the mining activity which will be occurring outside of the 30' buffer.

Effects to Stream Channels: There will be no disturbance of the stream channel. The 30' buffer will ensure that the channel is not disrupted and the buffer will protect the integrity of the streambanks (see Watershed section from rationale for the 30' buffer).

Cumulative Effects

Alternative A

The stream would slowly continue its improving trend, which was identified in the existing condition section of this document. There would continue to be sediment introductions from the road network within the drainage. Streambanks would stabilize and the riparian zone would mature which would eventually lead to recruitment of woody debris and the development of higher quality overwintering habitat.

Alternative B

Cumulative Effects within the East Fork of Emerald Creek include; activities listed in Table 3-6, past activities which have created the current condition, the test trenches in the tributaries to the East Fork: Strom Gulch, Pee Wee Gulch, No Name Gulch, 281 Gulch and Garnet Gulch, and the subsequent recreational garnet mining operation in one of the streams (Pee Wee Gulch, No Name Gulch, 281 Gulch or Garnet Gulch), at any given time.

Of the three issue indicators selected for this project the issue of Effects to Sediment is the main issue, which will be cumulatively influenced by this project. There will be minimal, if any effects, from the test trenches. As the garnet gemstone mining in a tributary nears the confluence with the East Fork of Emerald it is likely that some sediment produced from that activity would reach the East Fork of Emerald Creek. This sediment material will occur primarily as fine sediment. This will dissipate out shortly downstream of the confluence of the tributary and the East Fork. This fine sediment will reduce the amount of available interstitial spaces between the rocks. It will likely have little effect on fry because of their ability to relocate to find suitable areas. The sediment introduced by the tributaries combined with the sediment produced by the potential development activity, will have a negative effect on the fishery of the area; however, the rehabilitation measures described in Chapter 2 would return woody debris to provide habitat and the use of the suction dredge would reduce the potential for pool filling.

Alternative C

Cumulative Effects within the East Fork of Emerald Creek include; activities listed in Table 3-6, past activities which have created the current condition, the test trenches in the tributaries to the East Fork: Strom Gulch, Pee Wee Gulch, No Name Gulch, 281 Gulch and Garnet Gulch, and the subsequent recreational garnet mining operation in one of the streams (Pee Wee Gulch, No Name Gulch, 281 Gulch or Garnet Gulch), at any given time.

Of the three issue indicators selected for this project the issue of Effects to Sediment is the main issue, which will be cumulatively influenced by this project. There will be minimal, if any effects, from the test trenches. As the garnet gemstone mining in a tributary nears the confluence with the East Fork of Emerald it is likely that some sediment produced from that activity would reach the East Fork of Emerald Creek. This sediment material will occur primarily as fine sediment. This will dissipate out shortly downstream of the confluence of the tributary and the East Fork. This fine sediment will reduce the amount of available interstitial spaces between the rocks. It will likely have little effect on fry because of their ability to relocate to find suitable areas. The potential development of the commercial garnet sand mining (30 foot buffer) will create insignificant amounts of sediment to the channel. This combined with the effects from the recreational mining will have very minor effects to the habitat within the East Fork.

Tributary to the West Fork Emerald

Table 3-7 - Activities Analyzed for Tributary to the West Fork Emerald Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands Potential Development	Leasing and commercial mining of garnet sands	N	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
	Grazing	Y	Y	Y

Direct, Indirect and Cumulative Effects Effects

Alternative A

There would be no activities in this drainage in this alternative were implemented. There would be no change to the current condition of this stream if this alternative were selected.

Alternative B and C

This tributary to the West Fork of the St. Maries River is not utilized by fish, therefore the effects to this stream would be based on effects to water quality. For a determination of those effects refer to the Watershed report.

West Fork Emerald

Table 3-8 - Activities analyzed for West Fork Emerald Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	No Direct Activity	N	N	N
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
	Fire Suppression	Y	Y	Y

	Fire Suppression	Y	Y	Y
	Forest Products / Recreation Uses	Y	Y	Y
	Grazing	Y	Y	Y
Private/State	Timber Harvest	Y	Y	Y
	Road Construction	Y	Y	Y
	Garnet Sands Mining	Y	Y	Y
Ongoing	Brook Trout present	Y	Y	Y

Direct and Indirect Effects

Alternatives A, B and C

There would be no Forest Service activities in this drainage in these alternatives.

Alternative B

There are no activities planned in the West Fork under this alternative.

Alternative C

There are no activities planned in the West Fork under this alternative.

Cumulative Effects

Alternative A

There would continue to be activity on private and state lands in this drainage the effects of those activities are described in the section titled Effects Common to All Alternatives. There will be garnet sand mining occurring in the upper section of the West Fork in the near future. Following that activity they will rehabilitate the stream. This activity will add some sediment to the West Fork, which will eventually filter downstream through the section of the West Fork into which the project area Tributary drains.

Alternative B

The watershed report indicates that sediment produced from the mining activity in the Tributary to the West Fork will eventually reach the West Fork. This fine sediment is likely to cover the interstitial spaces between the rocks, which are important for overwintering of young fish. However because of the size of the West Fork, the minimal amount of area, which is expected to be affected by this fine sediment and the ability of the fish to move to suitable locations it is not except to appreciably affect the young fish. The timing between the implementation of the garnet sands mining on non-Forest Service land upstream of the project area and that proposed on the Forest Service lands should not combine to create negative instream effects.

Alternative C

The watershed report indicates that the implementation of the 30-foot buffer will sufficiently reduce the potential for sediment reaching the tributary to make in unlikely that any sediment

would reach the West Fork. The Forest Service activity will therefore not add to the cumulative condition of the West Fork.

Emerald Creek - Mainstem

Direct, Indirect Effects

Effects to Riparian Vegetation: There are no Forest Service activities planned in the mainstem Emerald Creek therefore effects to the riparian vegetation due to the implementation of this alternative.

Effects to Sediment: Due to the short distance between the lower most mining areas in the East Fork of Emerald Creek it is likely that some amount of sediment will reach Emerald Creek.

Effects to Stream Channel: There are no Forest Service activities planned in the mainstem Emerald Creek, but the minor amounts of sediment reaching this section of stream may have a short term negative effect on pool habitat.

Cumulative Effects

The combination of activities on private and Forest Service lands were considered for this analysis. Cumulative effects to this stream relate primarily to the increases or decreases in sediment. The watershed section identified that if design criteria are implemented there would be no effect to water resources, based on this conclusion there would likewise be no effect to the fishery in Emerald Creek.

Bechtel Creek

Table 3-9 - Activities Analyzed In Bechtel Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Two Test Trenches	N	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
Future Foreseeable Action	Hidden Cedar	Y	Y	Y

Direct and Indirect Effects

Alternative A

There will be no new activities within this drainage from the implementation of this alternative.

<u>Alternatives B and C</u>

<u>Effects to Riparian Vegetation</u>: There will be no trees cut, the trenches will be located at a minimum 30' away from the water, the areas will be seeded and mulch and are only 15'x10'. These measures will prevent any discernible change to the riparian vegetation.

<u>Effects to Sediment</u>: The intact bufferstrip between the trenches and the stream, and the rehabilitation of the site immediately after completed will prevent any discernible amount of sediment from reaching the stream.

<u>Effects to Stream Channel</u>: The trenches will not be placed in the stream channel, therefore no effect to the channel.

Cumulative Effects

<u>Alternative A</u>

Although there are no activities planned in this drainage under this alternative, the current condition combined with the ongoing activity and the lack of effects associated to the future foreseeable activity of the Hidden Cedar EIS, will maintain this stream in its current condition.

<u>Alternatives B and C</u>

When activities in these alternatives are added to the current condition, the ongoing activity and the lack of effects associated to the future foreseeable activity of the Hidden Cedar EIS, this stream will remain in its current condition.

Cat Spur Creek

Table 3-10 - Activities Analyzed for Cat Spur Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Prospecting Permit	na	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Dutch Cat Timber Sales	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
	Powerlines	Y	Y	Y
	Grazing	Y	Y	Y
Private/State	Private Timber Harvest	Y	Y	Y
	Private Road Construction (known)	1.1	1.1	1.1
Ongoing	Brook Trout present	likely	likely	likely
Future Foreseeable	Hidden Cedar Timber Sale	Y	Y	Y

Direct and Indirect Effects

Alternative A

There are no activities planned on NFS lands under this alternative.

Effects to Riparian Vegetation: There will be no disturbance of existing vegetation, therefore vegetation will continue to grow and become more effective at stream shading, providing woody debris recruitment and in stabilizing streambanks.

Effects to Sediment: There will be no increase of sediment input beyond that which is occurring currently.

Effects to Stream Channels: There will be no disturbance of existing stream channels. Natural processes which develop undercut streambanks and pool development will continue.

Alternatives B and C

Proposed activity in the Cat Spur Creek drainage is the same for both action alternatives therefore the effects will be the same. In the past, prospecting permits have been approved on a tributary to Cat Spur Creek. Another permit is being requested on this tributary and likely would also occur within the RHCA of Cat Spur Creek. The previous biological assessment (BA) written August 5,1999 determined that the activity would be "May effect, not likely to adversely affect" for bull trout (threatened species, ESA) and "May impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or loss of viability to the population or species" for westslope cutthroat trout (sensitive species, USFS).

The proposed permit would cause less disturbance than the past prospecting activity because the past permit allowed for the use of mechanized equipment to dig trenches whereas the proposed permit calls for hand dug trenches.

Effects to Riparian Vegetation: Although impacts would be reduced there would still be an impact to the riparian vegetation. The use of the same design criteria used for the previous permit will reduce the impacts of this project, specifically the revegetated and no trees should be cut.

Increases in Sediment: This activity could increase risks to the fisheries resource as a result of the potential for increased sediment production. Increased sediment production would further degrade the marginal conditions of spawning habitat for native salmonids in the lower reaches of Cat Spur Creek by contributing to fine sediment production and elevating the severity of substrate embeddedness. Increased sediment production would also impair pool habitat by affecting the rate of pool filling and the availability of substrate interstices used for hiding. However, conditions developed in the 1999 BA for the proposed exploratory mining activity in the Cat Spur Creek watershed would again be required under this permit and therefore are expected to be sufficient to alleviate fisheries concerns and protect fish habitat

conditions. Monitoring of the 1999 project reports were design criteria where implemented showed they were effective (PF Doc "Project Monitoring Related to Garnet Mining Permits").

Effects to Stream Channels: There should be no effect to the streambanks if the design criteria are implemented. The criteria specify a 50' buffer on Cat Spur Creek and a 20' buffer on the ephemeral channel. There will be no instream activity therefore the will be no change to the stream channel.

Cumulative Effects

Alternative A

As described in the section titled Effects Common to All Alternatives, on-going activities within this drainage will either have no effect or minor effects with the following exceptions, Dutch Cat Timber Sales, private timber harvest and road construction, grazing and the probable presence of brook trout. Dutch Cat will have short-term effects with long term benefits (see section titled Effects Common to All Alternatives).

Currently habitat within Cat Spur Creek is impaired. This condition will not change if Alternative A is selected. The trend for this stream will continue to be "functioning at risk."

Alternatives B and C

Activities which were analyzed in Alternative A will also occur if either of these alternatives is selected therefore the effects described for that alternative are also considered for these alternatives.

Currently habitat within Cat Spur Creek is impaired. This condition will not change due to the activity proposed under these alternatives. The implementation of the proposed activity will not contribute to the cumulative impacts which were identified under the no action alternative. The trend for this stream will continue to be "functioning at risk".

Wood Creek

Table 3-11 - Activities analyzed for Wood Creek

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	Test Trenches	na	Y	Y
	Potential Development – Recreational Garnet Gemstone Extraction	na	Y	Y
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
	Grazing	Y	Y	Y
Future Foreseeable FS	Hidden Cedar	Y	Y	Y
Private/State	State Highway	Y	Y	Y
	Railroad	Y	Y	Y

Ongoing	Brook Trout present	Y	Y	Y

Direct and Indirect Effects

Alternative A:

There is no activity proposed under this alternative.

Alternative B and C:

These alternatives have the same activities proposed for this drainage so the effects will be the same.

The proposed activities will have direct and indirect effects on aquatic habitat in the project area. These effects are expected as a result of removing riparian vegetation to prepare the areas for digging, excavating in stream channels and flood plains to prepare areas for public digging, dewatering sections of stream to reduce sediment production during the operation, and reconstructing or constructing dams for sediment settling ponds. The timing of these activities can also influence the degree that the fisheries resources will be affected.

Effects to Riparian Vegetation: Removing brush and trees at the dig sites within riparian habitat conservation areas (RHCA's) as defined in the Inland Native Fish Strategy (INFish) (USDA Forest Service 1995) can have several adverse effects to the aquatic environment. Riparian vegetation is an important component of stream shading which helps protect stream temperatures from reaching stressful levels for coldwater biota.

Riparian vegetation also contributes to the stability of stream channels. Root mass from streamside vegetation helps hold soil particles together and offers resistance against the erosive energy of streams on their banks. In addition, vegetative stems, leaf litter, and tree trunks offer friction elements that can decrease the erosive energy of out-of-bank flows and increase soil stability in flood prone areas. The stability of soils in the flood plain can influence the rate of channel migration and therefore effect the stability of stream channels. Removing riparian vegetation would likely increase sediment production and reduce channel stability.

The removal of streamside vegetation would also reduce the contribution of terrestrial vegetation to in-stream cover for fish inhabitants. Removing trees within the riparian will affect the future recruitment potential for large woody debris to the channel. Large woody debris is instrumental in developing and maintaining important components of fish habitat such as pools and cover complexity. Removal of streamside brush can also reduce overhead cover as well as in-stream cover because brush limbs often hang in the water or close to the water surface.

Returning soils in the proper soil layer sequence to improve the potential for success of revegetating the area and planting trees and shrubs within the riparian zone during the rehabilitation will reduce the impact of this mining on the contribution of the riparian vegetation to the stream environment.

Effects of Sediment: Excavating the stream channel and flood plain of a stream for the purpose of garnet gemstone extraction will increase sediment production and disrupt channel

equilibrium. The increase in sediment can degrade the quantity and quality of spawning and rearing habitat for native salmonids. The timing of excavation can also influence the extent that the physical and biological components are affected.

Effects from excavating in fish-bearing reaches are minimized by delaying this operation until lower flow periods of summer and after fry emergence have been achieved. The effect will also be somewhat reduced through the installation of woody debris structures and planting of vegetation on the new stream bank, but it will be several years before it becomes stable. Another means of minimizing effects is to implement the design criteria, which requires that all areas be rehabilitated in the fall to a condition that prepares it to handle the next year's spring run-off thus minimizing the potential for erosion. Careful rehabilitation of disturbed sites can encourage recovery and help reduce the long-term impact of this activity on the aquatic environment.

<u>Effects to Stream Channels:</u> Mining for garnet gemstones eliminates instream fish habitat within the section that is being mined. Undercut banks are an important source of hiding cover. Undercut banks will not be restored during rehabilitation but will overtime be developed as vegetation becomes established and the channel begins to stabilize.

There are several design criteria which were developed to help minimize the effects of the mining on the stream channels. Limiting the mining to average 200-300' of disturbed stream per year will ensure that there remains some sections of stream downstream of the project which are still suitable habitat. However as the mining progresses downstream the amount of undisturbed area becomes reduced each year. Rehabilitated areas upstream of the active mining site will slowly recover and may become useful as the mining area moves downstream. Rehabilitation of the site will be completed prior to fall. The rehabilitation includes the placement of trees, which had been cut to facilitate the mining, into the stream channel. This return of woody debris to the channel reduces some of the impacts created by the mining.

Cumulative Effects

Alternative A

The effects of on-going activities were described in the section titled "Effects Common to all Alternatives." These activities were determined to have either no effect or very minor effect, except for grazing and the presence of brook trout. These two activities were determined to have the potential for negative impacts. The activities associated to the Hidden Cedar EIS were also discussed in the Effects Common to All Alternatives."

Based on this information this stream will be maintained in a "functioning at risk" condition.

Alternatives B and C

Cumulative effects on the fisheries resources where recreational garnet digging is being proposed include prior timber harvesting in the head waters, prior road building, and prior garnet digging operations in and along the stream. The combination of effects from past land management activities and the direct and indirect effects from continued garnet digging operations will further degrade stream resources. This suggests that continuing the garnet

digging operation is inconsistent with the purpose of INFish. However, INFish recognizes the unique challenges of managing mineral resources while protecting aquatic environments. INFish standard MM-1 states "Minimize adverse effects to inland native fish species from mineral operations ... For operations in a Riparian Habitat Conservation Area ensure operators take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat which may be affected by the operations." Although fish habitat conditions are expected to be adversely impacted by cumulative effects, the garnet digging operation includes measures that help minimize impacts to aquatic resources (e.g. seasonal limitations and rehabilitation) and thereby address INFish standard MM-1.

West Fork St. Maries

Table 3-12 - Activities analyzed for West Fork St. Maries River

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	No direct activities	Na	Na	Na
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and other	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
	Grazing	Y	Y	Y
Private/State	State Highway	Y	Y	Y
	Railroad	Y	Y	Y
	Road construction	Y	Y	Y
Ongoing	Brook Trout present	Y	Y	Y
Future Foreseeable Forest Service	Hidden Cedar Timber Sale	Y	Y	Y

Alternative A

Direct and Indirect Effects

There are no activities planned in this drainage under this alternative.

Alternative B and C

These alternatives are the same within the West Fork of the St. Maries River.

There are no activities proposed within the West Fork by the Stars and Sands project.

Cumulative Effects

Alternative A

This alternative will take into consideration all the activities described in the above table. The effects from the ongoing activities in this drainage were outlined in the section titled Activities Common to All Alternatives. Some of these activities are having some level of negative effect

to the drainage and combined with the Future Foreseeable activity these activities will maintain this stream in a “not functioning properly” condition.

Alternatives B and C

The West Fork of the St. Maries River is the main tributary into which Cat Spur Creek and Wood Creek flow therefore cumulative effects from the proposed activities in those drainages will be considered in association with the activities described in the above table.

As described in the analysis for the Cat Spur drainage, the proposed activity will not alter the current condition of Cat Spur Creek, therefore no effects will be discernible in the West Fork. The test trenches in Wood Creek would also not have an effect on the current condition. The development of a recreational garnet extraction site will have a negative effect on Wood Creek, which in turn could have a negative effect to the West Fork itself, however because of the distance between the downstream end of the mining and the confluence with the West Fork it is unlikely that a measureable amount of sediment would be observed in the West Fork.

Although it is anticipated the there will be no effect to the West Fork of St. Maries due to the implementation of either of these alternatives, based on current condition, and ongoing activities, this stream will remain in its current condition of not functioning properly.

Lower St. Maries River

Table 3-13 - Activities analyzed for Lower St. Maries River

Decision Authority	Activity	Alt A	Alt B	Alt C
Stars and Sands	No Direct Activity	na	na	na
Ongoing FS	Outfitter/Guide	Y	Y	Y
	Noxious Weeds	Y	Y	Y
Ongoing FS and others	Fire Suppression	Y	Y	Y
	Forest Products	Y	Y	Y
	Recreation Use	Y	Y	Y
	Grazing	Y	Y	Y
Private/State	State Highway	Y	Y	Y
	Railroad	Y	Y	Y
	Private Timber Harvest	Y	Y	Y
	Garnet sand mining	Y	Y	Y
	Road Construction	Y	Y	Y
	Clarkia (homes and businesses)	Y	Y	Y
Ongoing	Brook trout present	Y	Y	Y
Future Foreseeable Forest Service	Hidden Cedar EIS projects	Y	Y	Y

Alternatives A, B and C

Direct and Indirect Effects

There will be no activity directly in the St. Maries drainage associated to these alternatives.

Cumulative Effects

Alternatives A, B and C

The effects of on-going activities were described in the section titled "Effects Common to all Alternatives." The majority of these activities were determined to have either no effect or very minor effect, the exceptions to this are the timber harvest and road construction activities on private lands, Clarkia and other private businesses, presence of brook trout and grazing (on-going and future foreseeable). These activities have all been determined to create a risk for negative effects.

The Forest Service is not proposing any activity under this alternative therefore there will be no contribution to cumulative effects from Forest Service activity. The St. Maries River is currently listed as an impaired watershed. This in combination with continued high road density, the presence of brook trout in the system and the assumed continuation of timber harvest on private lands, it is expected that this drainage will remain in a "not functioning properly" condition.

Summary of Effects for All Drainages

Alternative A should have the least amount of impact to the fisheries resource, because no additional disturbance would be occurring. This is accurate for the garnet sands mining but it is not completely accurate for the gemstone mining operation. This is due to the assumption that after the garnet gemstone mining in 281 Gulch is depleted and no other Forest Service managed operations are initiated, it is highly probable that unregulated mining would occur. If unregulated mining is not curtailed then it would have all of the detrimental effects already discussed, but unlike the mining which is operated by the Forest Service, unregulated mining would have none of the rehabilitation efforts which minimize the negative effects.

Alternative B is the most impactive to the fisheries of the three alternatives if the potential development is considered. This activity will completely alter instream fish habitat of both East Fork Emerald (sand extraction) and one of the tributaries (gemstone extraction). Although the mining company has shown that their rehabilitation efforts are an improvement over unrehabiltated lands there is still an unspecified amount of time that it will take the stream to return to at least the same quality of habitat as prior to the relocation. This same statement is true for the mining on Forest Service lands although as mentioned for Alternative A the potential for unregulated mining could cause even greater problems. The long term development of the area would eventual create disturbance of all four spawning/early rearing streams within the project area.

Alternative C is the least impactive of the alternatives if the potential for unregulated mining could not be eliminated. It allows garnet gemstone mining, which should minimize the amount of unregulated mining and the Forest Service managed operation will rehabilitate the area which should reduce the impacts to the fishery. The long term development of the area would however, eventually create disturbance of all four spawning/early rearing streams within the project area. The effects to East Fork of Emerald are also the least impactive under this alternative because of the establishment of a buffer and the retention of the stream channel in its current location.

All other aspects of this project would have similar results between the alternatives.

Compliance with Forest Plan Standards and Laws

Compliance with IPNF Forest Plan and INFish Guidelines: There are 6 general standards in the IPNF Forest Plan plus the additional standards of INFish, which are applicable to the fisheries resource (IPNF Forest Plan, II-29-31, INFish). Standard 3 does not apply to this project because none of the streams identified in that standard are located in this project area. INFish requirements include but are not limited to standard MM-1 "Minimize adverse effects to inland native fish species from mineral operations...For operations in a RHCA ensure operators take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat which may be affected by the operation. When bonding is required, consider ... the cost of stabilizing, rehabilitating, and reclaiming the area of operation. Standard MM-2 "Locate structures, support facilities and roads outside of RHCAs. Where no alternative to siting facilities in RHCA's, locate and construct the facilities in ways that avoid impacts to RHCA's and streams and adverse effects on inland native fish...." Standard MM-3 "Prohibit solid and sanitary waste facilities in RHCA. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RHCA's exists, and releases can be prevented and stability can be ensured, then: ..." Standard MM-5 "Permit sand and gravel mining and extraction within RHCA only if no alternative exist, if the action(s) would not retard or prevent attainment of RMOs and adverse effects to inland native fish can be avoided." Standard MM-6 "Develop inspection, monitoring and reporting requirements for mineral activities. Evaluate and apply the results of inspection and monitoring to modify mineral plans, leases, or permits as needed to eliminate impacts that prevent attainment of RMOs and avoid adverse effects on inland native fish."

An Interagency Implementation Team reviewed the Emerald Creek Recreational Dig in September 1999 to determine if it was in compliance with INFish (project file document titled "USDI BLM, Oct 26, 1999). That report stated that the mining did not appear to be in compliance with INFish and that there was a need to minimize the impact of the activity. It also identified the need for annual rehabilitation of the site to accommodate the spring/winter runoff. Annual rehabilitation is currently being done at this site. The design criteria developed for this project are anticipated to address these concerns. It is acknowledge that fish habitat conditions are expected to be adversely impacted by effects to the streams in which recreational garnet mining will occur, however the regulation of the activity and the design criteria developed for the project should help to minimize impacts to the aquatic resources and thereby address InFish standard MM-1. The review went on to comment that a watershed assessment should be conducted to identify trade-offs, which may need to be made. Compliance with MM-2 will be met because there will be no new support facilities constructed in the RHCA, existing parking areas will be used. Compliance with MM-3 will be met because there is no potential for increased chemical contamination from this project, and various design criteria have been developed to reclaim and monitor the tailings from the mining activity. MM- 5 will be met because the decision associated to this project in regards to sand extraction, relates solely to the digging of test trenches. The test trenches will not retard or prevent attainment of RMO's. If subsequent mining of the sands, identified in this document as "potential development" should occur, a separate NEPA document will be developed to consider that activity. The possible conflict between standards in the Forest

Plan that apply to this activity should be resolved prior to the initiation of that separate NEPA document. MM-6 will be met based on the development of monitoring plan identified in Chapter 2 of this document.

In the table below, Disturbance to Riparian Zone, identifies the percentage of the riparian zone within the drainage which will be impacted. Increase in sediment indicates whether the implementation of the project will increase sediment to the stream channel. Alteration of Stream Channel indicates the percentage of fish habitat which would be affect if the alternative were implemented. This information identifies the short term disturbance.

Table 3-14 – Summary Issue Indicators for Fisheries

Stream Name	Issue Indicator	Alt A	Alt B	Alt C
East Fork Emerald includes Potential development)	Disturbance to Riparian Zone	0	2%	2%
	Increase in Sediment	N	Y	Y
	Alteration of Stream channel	0	22%	0
No Name Gulch	Disturbance to Riparian Zone	0	37%	37%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Pee Wee Gulch	Disturbance to Riparian Zone	0	100%	100%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
281 Gulch	Disturbance to Riparian Zone	0	50%	50%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Strom Gulch	Disturbance to Riparian Zone	0	68%	68%
	Increase in Sediment	N	Y	Y
	Alteration of Stream channel	0	0	0
Garnet Gulch	Disturbance to Riparian Zone	0	37%	37%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	100%	100%
Tributary to the West Fork of Emerald (includes Potential development)	Disturbance to Riparian Zone	0	22%	22%
	Increase in Sediment	N	Y	Y

	Alteration of Stream channel	0	0	0
Wood Creek	Disturbance to Riparian Zone	0	20%	20%
	Increase in Sediment	Y[1]	Y	Y
	Alteration of Stream channel	Y[1,2]	56%	56%
Cat Spur Creek	Disturbance to Riparian Zone	0	1%	1%
	Increase in Sediment	N	N	N
	Alteration of Stream channel	0	1%	1%

1) it is assumed that unregulated mining would increase in these drainages which would cause an increase in sediment

2) it is assumed that unregulated mining would occur in these drainages but it is unknown to what extent the channels would be altered.

HERITAGE RESOURCES

Regulatory Framework

Heritage resources include buildings, sites, area, and objects having scientific, historic, or social values. They comprise an irreplaceable resource relating past human life. The "keystone" legislation of modern heritage resource management is the National Historic Preservation Act of 1966 (amended and expanded in 1976, 1980 and again in 1992). All other heritage resource management laws and regulations support, clarity or expand on the National Historic Preservation Act. Federal Regulations 36 CFR 800, 36 CFR 63 and Forest Service Manual 2360 (FSM 2360) contain the basis of specific Forest Service heritage resource management practices. All of these laws, regulations and direction guide the Forest Service in identifying, evaluating and protecting heritage resources on National Forest lands. The Forest Service is required to take into account the effect the agency's actions have on heritage resources that are either determined to be eligible for inclusion in the National Register of Historic Places (NRHP) or heritage resources that are not yet evaluated for eligibility. Eligible heritage resources are termed "historic properties". Specific locations of historic properties are exempt from disclosure under the Freedom of Information Act pursuant to 5 U.S.C. 552(b)(5). The Idaho Panhandle National Forests Forest Plan requires systematic cultural resource inventory prior to ground – disturbing activities and preservation of significant cultural resources in place whenever possible. The Forest Plan also requires consultation with the State Historic Preservation Officer to determine significance of the site; this is done with a process during site inventories.

A number of federal regulatory acts include an increasing role of tribes in the federal decision –making process. These acts include the Archaeological Resources Protection Act of 1979 which requires tribal notification and consultation where requested and consultation where requested in regard to proposed removal of artifacts by permit from public lands; the Native American Graves Protection and Repatriation Act of 1990 which recognizes Indian control of human remains and certain cultural objects found on public lands and requiring consultation

prior to authorized removal of such items; the National Historic Preservation Act of 1966, as amended in 1992, which more explicitly incorporates tribal involvement into the Section 106 consultation process and makes traditional use sites without physical remains eligible for listing in the National Register of Historic Places; and the Religious Freedom Restoration Act of 1993 which establishes a higher standard for justifying government actions that may impact religious liberties.

Analysis Area

The analysis area for heritage resources is the Project Area as defined in Chapter 1 of this EIS. The geographic scope of potential effects is the geographic area within which activities may cause changes in the character or use of historic properties.

Analysis Methods

When a project is proposed, previous historical work, existing archives, maps and photos are reviewed by the heritage specialist; surveys are conducted if needed. This project area has already been systematically surveyed for heritage resources. These surveys and known sites have been documented and recorded in many inventory reports. Additional surveys for any newly discovered sites would be documented in accordance with established Forest procedures. There has been adequate inventory coverage on all potential impact areas within the Project Area.

A project has an effect on a historic property when the project activities alter characteristics of the property that qualifies for inclusion in the National Register. For the purposes of determining effect, alteration of the property's location, setting, or use may be relevant depending on a property's significant characteristics.

Affected Environment

Most of the National Forest portion of the project area is on what is called "acquired lands." This means that someone else owned the land prior to acquisition by the National Forest. With most of the project area being within 1 mile of a major river and travelway, there has been a great deal of development and many activities over time. Euro-American settlement increased with the construction of the railroad between St. Maries and Bovill, Idaho in the early 1900's. Land management included settlement, mining, agriculture, logging, planting logged or burned areas, fire protection, roads, trails, and cattle and sheep grazing and blister rust control. The nearby community of Clarkia became an important center and "jump – off" point.

Most sites identified within the project area date to the historic period and are related to turn of the century activities listed above. There are no known prehistoric sites.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

There are no direct, indirect or cumulative effects expected with the No Action Alternative.

Alternatives B and C

The proposed alternatives include garnet sand and gemstone removal in a variety of ways by hand digging and machine excavation (See Chapter 2 for alternative descriptions). Some of the sites are within riparian areas and there are heritage properties in some of the activity areas. The preferred method for conservation of these resources is site – avoidance and this has been planned for all alternatives. There are no specific heritage sites that would be impacted. The potential does exist for finding additional sites during project implementation. If additional sites are discovered, the sites would be inventoried and then protected if found to be of cultural significance. The decision to avoid, protect or mitigate impacts to these sites would be in accordance with the National Historic Preservation Act. With site – avoidance being the method to preserve heritage resources, the action alternatives are basically the same as No Action in terms of effects to the heritage resource. There are no expected direct, indirect or cumulative effects to the heritage resources with implementation of the action alternatives.

Consistency with the Forest Plan and Laws

Systematic inventory and reports are complete for this project area and Native American groups have been given the opportunity to comment. All alternatives comply with the National Historic Preservation Act and the IPNF Forest Plan.

MINERALS AND GEOLOGY

Regulatory Framework

The analysis in this EIS follows the laws and regulations set forth in Appendix B. See Appendix **B** for detailed descriptions and further reference. Additional direction, goals, objectives, standards, and guidelines for management of mineral resources are also provided in the Idaho Panhandle National Forests, Forest Plan (1987).

Minerals General

- Mining and Minerals Policy Act of 1970

The Mining and Minerals Policy Act of 1970 reiterates Congress's intent to allow minerals development under appropriate circumstances.

Hardrock Mineral Leasing on Acquired Lands

- Mineral Resources of Weeks Law Lands Act of March 4, 1917
- Reorganization Plan No. 3 of 1946
- 43 CFR 3500 Leasing of Solid Minerals Other Than Coal and Oil Shale

- The Mineral Leasing Act for Acquired Lands of 1947

Leasing of hardrock minerals located on acquired lands can be authorized by the Secretary of Interior with the consent of the Secretary of Agriculture. Metals, rare earth elements, and uncommon varieties of sand, stone, gravel, pumice, pumicite, cinders, clay, and gem quality garnets are considered leasable hardrock minerals when located on acquired lands.

The Secretary of Interior has the responsibility to permit prospecting, development, and the utilization of mineral resources. He/she also has the authority to assure that stipulations in the permit, lease, or license are followed and adhered to.

The Secretary of Agriculture can consent to the issuing a permit, lease, or license, and can identify stipulations protecting surrounding resources should a permit, lease, or license be issued. He/she also has the discretion to not consent to the issuance of a permit, lease, or license if effects of the proposal to the surrounding resources cannot be mitigated.

Further discussion of Mineral Collecting - 43 CFR 3560.7 Hardrock Mineral Specimen Collection, Saleable Minerals - 36 CFR 228 (c) Disposal of Mineral Materials, and Locatable Minerals - General Mining Law can be found in Appendix **B**.

Analysis Area

The geographic scope for the Minerals and Geology analysis is defined by the project area boundaries and consists of 31,818 acres in which 36% is privately held. Further description of the project area can be found in Chapter 1, Purpose and Need.

The Idaho Panhandle National Forests Forest Plan (1987) designates the project area as a combination of Management Areas 1 (MA 1), 4 (MA 4), and 5 (MA 5). See Chapter 2 for more information on these Management Areas. Additionally, Appendix AA (Emerald Creek Garnet Area Management Plan) of the Idaho Panhandle National Forests Forest Plan provides general management information about the garnet collecting area.

Existing Condition

Geologic Setting

The project area is located on the western flank of the Northern Rockies where flood basalts of the Columbia Plateau backed up into stream valleys along the western edge of the mountains. Precambrian metasedimentaty rocks correlating to the Belt Supergroup underlie most of the vicinity, although some granitic and higher-grade metamorphic rocks are also present.

Locally, highly metamorphosed Precambrian sedimentary rocks underlie the project area with plutonic outliers of the Idaho batholith dispersed throughout. Dikes and sills of gabbroic and granitic composition are also found in the vicinity. Basalt flows during the Miocene dammed the St. Maries River causing a lake to form. Sedimentary deposits from this Miocene lake are exposed in several locations throughout the project area and contain fossils of leaves and fish.

The distribution of the garnet resource in the area is controlled by specific geologic parameters. Garnet formation and distribution seems to be controlled by metamorphic gradation from the Idaho Batholith and structural extent of Precambrian rock formations located along the border of the Batholith. These structures could have been formed in response to the collision and accretion of Permian and early Mesozoic units to the continent producing northeast trending fold axes and northwest trending lineations and fold axes. Intrusion of the batholith and subsequent metamorphism occurred shortly after in the late Cretaceous.

The primary contributor to the occurrence of garnet is the type of garnet bearing parent material. In the project area, this rock formation is the upper schist member of the Precambrian Wallace Formation. Large garnets (greater than one pound in weight) to sand-sized garnets are found in an area determined by the occurrence of the garnet bearing rock formation; the physical distance that the garnets can be transported down stream from the rock formation; and the topographic expression of the land surface on which the garnets deposit. Basically, the garnets can be divided into two categories: sand-sized and large garnets.

Sand-Sized Garnets

Small garnets and staurolite crystals are abundant throughout the schistose host rock. They are of economic importance where they have been concentrated in alluvium as a placer deposit. The hardness, durability, abundance, and location of the sand-sized garnets in Emerald Creek create a minable and very economical deposit. Specific strata or zones containing 10-12% garnet are not uncommon. The zones range from a few inches to 60 inches in thickness.

A significant geological control on the deposition of garnets in these strata appears to be the Miocene Lake Clarkia. Remnants of the lake beds, now broad and flat valley floors, caused the deposition of the gravels containing garnets as the gradient slowed and the latter day streams meandered across them. Minable deposits of garnet sand are commonly found just above the clay strata (which contains fossils of leaves and fish), formed from lacustrine deposition. In some cases, the garnet bearing gravel is also found below the clay layers, but the depth makes it cost prohibitive to mine at this time. When there are no lacustrine deposits, the gravels lie directly on weathered schist.

The primary garnet mining company in the Emerald Creek area is the Emerald Creek Garnet Corporation (ECGC). ECGC supplies between 15% and 20% of the world industrial garnet supply off of private, State, and National Forest lands in the Emerald Creek area (personal communication – Mike Zientek, USGS – 5/9/2001). ECGC produces 30 thousand tons of garnet per year with 6 million dollars in product sales (personal communication – Steve Osburn, ECGC). The garnets are valuable as a specialty abrasive because they are hard, non-toxic, non-radioactive, acid resistant, recyclable, and generate minimal dust when blasted. Approximately 70% of ECGC sales are comprised of this specialty abrasive market with applications such as abrasive blast cleaning of U.S. Navy ships and submarines where a non-radioactive abrasive is essential. Other major applications for the garnets produced by ECGC include high temperature deep oil well packing, water filtration media, and water jet cutting abrasive (personal communication – Steve Osburn, ECGC).

Large Garnets

The large garnets (greater than ¼" in diameter) are sought both as gems and collector specimens. The project area produces an extraordinary quality and quantity of large garnets. The gem quality is exceptional, in part because the garnets maintain their dodecahedron crystal shape and are not prone to fracturing. Some of the drainages produce star garnets. These internal "stars" are an asterism caused essentially by crystals, such as rutile, within the garnet crystal structure. The star is an optical phenomenon called chatoyancy in which a movable wavy or silky sheen is concentrated in a narrow band of light that changes its position as the mineral is turned. It is best seen in a cabochon-cut gemstone. The only other location in the world that is known to have star garnets is in India. Garnets or garnet chips that are at least ¼" in size, not fractured, and do not contain inclusions (other minerals such as mica flakes) can be faceted into a cut stone.

There is significant variability by location on the quality and quantity of garnets found. Some drainages have abundant garnets of variable size as well as the highly valued star garnets.

The geologic controls on the occurrence of the large garnets have not been determined with any certainty. Larger garnets tend to be found along the axis (hinge line) of a northwest plunging syncline (the trough of a fold in the rock layers that is tipped on end) in the upper schist unit of the Wallace Formation. Bechtel Butte is located on the eroded nose of this syncline. Bill Rember, Idaho Geological Survey geologist (1996) has reported that the size of the individual garnets is dependent on the depth of the schist and the proximity to the axis of the syncline. The largest garnets are found nearer to the base of the upper schist and closer to the axis of the syncline. Some areas such as Cat Spur Creek are slightly different in geology since the garnets found there come from an upper quartzite gneiss unit.

Previous studies by USFS geologists noted that there is a topographic flattening above which the garnets were not found in the streams of the project area. One possibility is that this is due to Miocene Lake Clarkia, which existed over the drainage basin prior to deposition of the garnet bearing gravels. Additional evidence suggests that the topographic flattening predates Miocene Lake Clarkia and in fact may have controlled the lake level. The lakeshore was approximately 3,500 feet in elevation with substantial amounts of garnets found only beneath the elevation of the erosion surface or shoreline. Much of the bedrock is extremely decomposed, probably as the result of increased water saturation and weathering during the existence of the Lake. Silica is more prone to weathering in a warm, humid environment, like that which existed in Miocene time. Garnets were released from the bedrock during fluvial erosion and were either deposited in-situ, or transported downstream as placer deposits during and after the existence of the lake. This theory does not account for the garnets found at Bechtel Butte and Cat Spur Creek, which are found at higher elevations. It does appear that the Miocene conditions accelerated weathering of micaceous schist, since most of the garnets are found within the decomposed bedrock.

Large garnets have also been found within the valley bottom sand deposits. These are usually of good quality because they have survived the erosion process intact. They are generally not as concentrated, however, and under a significant amount of overburden.

Historical Garnet Resource Development

Undoubtedly, mining and collecting of garnet in the project area has occurred at various intensity levels since people have inhabited the area. During the last 50 years there has been an emphasis in two areas, small scale gemstone collecting and larger scale garnet sand mining.

The project area includes many large deposits of sand-sized garnet that are of excellent quality. Mining for these garnet sands on both Federal and private lands has been consistent over the last 20 years. An approximate average of 20 acres per year have been mined in or near the project area on combined ownership (federal, state, private). The most recent garnet sand mining on USFS lands was a 12-acre site on the East Fork of Emerald Creek, lease number ID 25554, which was mined in 1992 and 1993 by ECGC.

Most of the past mining for garnet sands in the project area has occurred in the floodplain along the East and West forks of Emerald Creek. In narrower areas, the high-grade concentration of garnets can make up for the decreased areal extent. The recent reclamation, both in the narrow and broad stream valleys, has been successful; and in some cases, damage from past mining was corrected when the area was re-mined.

Unauthorized digging for gemstone garnets at sites within the project area on USFS lands developed into a chronic administrative problem. In 1973, an administrative closure was applied to lands within the project area in order to prohibit unauthorized collection of gemstone garnet on USFS Lands. An organized USFS public recreational digging program was implemented. Further description of this public recreational digging program can be found in the Recreation Section of this EIS.

Collecting of Garnets

Collecting of garnets for recreational purposes has been a traditional use of the Emerald Creek area for at least 50 years. Collecting occurred prior to the USFS acquisition of the land in 1970, when portions of the land belonged to Sunshine Mining Co. and Potlatch Timber Co. However, when the USFS acquired the land, they saw the need to apply some management measures that would constrain the public from digging indiscriminately and causing resource damage. This involved posting the administrative closure in 1973 for garnet digging within the area except where a permit had been issued. This closure prohibited "the removal of garnets from federally owned lands except as authorized by a mineral collecting permit or in an area presently under lease." The pre-existing lease at Shorty's gulch (I016415), issued in 1966, was the exception to this closure. However, the initial purpose of the lease was to allow the sale of garnet on a concession basis for "rock hound" use. In 1968, Mr. Sexton requested that the lease be changed so that he could mine the garnet sand on a commercial basis since "there were not enough garnets to attract rock hounds under the present operation" (BLM records). Business picked up when the USFS closed the area above the lease to random digging.

In 1969, the USFS made a request for an additional concession area to be leased. Advertisements of the new lease were made ready by the BLM but canceled because of public and congressional requests, as numerous comments were made by letter and petition that the USFS be authorized to individually issue permits rather than having another concession in the area.

Special rules were promulgated in 1973 to allow mineral collection on acquired lands within National Forests. These are found in 43 CFR 3541, FR July 16, 1973. Prior to that time, there was no authority to allow mineral collection except as a mineral lease. These rules were adopted in 1973, however they were specific to the Smoky Quartz Area on the White Mountain National Forest, N.H. and the East Fork of Emerald Creek on the St. Joe National Forest in Idaho. The permits needed to be signed by an authorized representative of the Bureau of Land Management.

These rules were in specific response to proposed congressional legislation that would designate East Emerald Creek as a National Recreation Area. Senator McClure drafted legislation in July 1969 "to establish the Idaho Star Garnet National Recreation Area." The area was to include all public land within the East Fork of Emerald Creek and its tributaries northeasterly to its junction with the West Fork of Emerald Creek. This bill was to provide the needed authority for the Dept. of Interior to issue mineral collection permits. It was based on the opinion of the Regional Forester in Northern Region 1, that without this bill, the area must either be closed to rock hounding or opened to the public through lease to a concessionaire. The bill was never signed. This lack of action was probably due to the fact that another route was taken to achieve the same goal, i.e., changing the Code of Federal Regulations.

In 1973, the USFS opened a garnet collecting area in No Name Gulch. A plan was developed that would allow certain drainages to be systematically mined and reclaimed through a permit system. A memorandum of understanding was prepared with the Bureau of Land Management to facilitate this system; wherein the USFS would administer the mineral collecting permits but transfer the money collected to the Bureau of Land Management. The plan that was developed is referred to as the Emerald Creek Garnet Management Plan, which is referenced as Appendix AA of the 1987 IPNF Forest Plan.

The Code of Federal Regulations was changed again in 1986 to allow the surface management agency to have jurisdiction to determine which areas and under what conditions mineral specimens may be collected for non-commercial purposes, and to issue permits if required (43 CFR 3560.7). These rules are specific to lands with acquired land status. They had nation-wide application and simplified the process for the USFS.

There are significant past actions that provide direction for the garnet resource in the Emerald Creek Area. They are summarized as follows:

1. Draft legislation in 1969 by Senator Jim McClure to "Establish the Idaho Star Garnet National Recreation Area." This area includes all the East Fork of Emerald Creek and its tributaries.
2. Administrative Closure in 1973 for "the removal of garnets except as authorized by a mineral collecting permit or in the area presently under lease from the Bureau of Land Management." The closure boundary incorporates all the of East Fork Emerald Creek drainage with acquired land status, including Bechtel Mountain. This closure recognizes that garnet collection is occurring in a defined area.
3. Special Rules promulgated in 1973 (43 CFR 3541) to allow mineral collection on acquired lands on the Smoky Quartz Area on the White Mountain National Forest, N.H. and the East Fork of Emerald Creek on the St. Joe National Forest in Idaho.

4. Mineral withdrawal in 1975 of portions of the public domain lands from non-metaliferous location by Public Land Order No. 5523. The justification for the withdrawal was to “protect the streams within the drainage (upper portion of the East Fork of Emerald Creek) in order to facilitate the planned development of the public garnet collection area on adjacent acquired lands.” This action also recognizes that garnet collecting is a popular activity in the area.
5. Rule change in 1986 (43 CFR 3560.7) to allow the surface management agency to have jurisdiction to determine which areas and under what conditions mineral specimens may be collected for non-commercial purposes. While the Emerald Creek area was not specifically mentioned, there are only a few of these areas nationwide and the change made it easier for the USFS to administer these collecting sites.

The series of actions listed above and numerous letters from the public found in the files indicate that recreational collecting of garnets by the public has been considered a prime objective for the Emerald Creek Area. Very few areas have been the subject of unique administrative action, or have, in fact, resulted in nationwide reform.

Leasing of Garnets

The authority for land acquisition is the Weeks Law of 1911. Lands acquired under this act have Weeks Law status, which means that the mineral rights cannot be obtained by locating a mining claim under the 1872 Mining Law Act. The 1947 Mineral Leasing Act of Acquired Lands made it possible to lease the mineral rights from the federal government. Prior to this time, the only minerals that were leasable were hydrocarbons, such as oil, gas, and coal. With the passage of this act, those minerals on these acquired lands that would be deemed otherwise locatable if they were found on public domain lands, became available for leasing. The Bureau of Land Management retains full authority for hard rock leasable minerals on National Forest Lands. They keep track of the system of prospecting permit applications, lease applications, as well as issue permits and leases. They assess and collect a rental fee and production royalty. They also determine if the prospective lessee has a "discovery" of valuable minerals before issuing a lease. USFS approval of the mining activity involved with the prospecting permit or lease and it is the responsibility of the BLM to see that the stipulations are adhered to.

Those interested in obtaining mineral rights to an area begin the process by filing for a prospecting permit with the BLM, for which they pay a filing fee. The BLM assigns a serial number to the permit application and forwards it to the USFS for recommendations on surface management protection. The USFS performs a NEPA analysis for a decision on approval and determines the stipulations to attach to the permit. When the BLM receives the USFS decision on the permit, they will issue it and charge an annual fee. This permit gives the permittee preference right to prospect the area and the sole right to apply for a lease to mine the mineral.

The next step is for the permittee to submit a lease application to the BLM and pay another filing fee. At this point, the BLM mineral examiner will determine if there is a “discovery” of valuable minerals and narrow the area of the lease to the appropriate acreage. The lease application is then forwarded to the USFS for a NEPA analysis, decision, and surface management recommendations, similar to the prospecting permit. The Regional Forester

can recommend against issuance of a permit or lease if the analysis shows that the proposed mineral activity would seriously interfere with other resource values (FSM 2822.45). The BLM usually rejects permit or lease applications for which the USFS recommends against issuance. An aggrieved party can appeal the decision to a USFS Officer, or to the Secretary of Interior.

Current Activity

Emerald Creek Garnet Company (ECGC) is the company with pending prospecting permits for garnet sands in the East and West Forks of Emerald Creek. ECGC currently employs between 50 and 60 local people with a annual payroll of approximately 1.5 million dollars. Of these local employees, 90% are full time with typical salaries ranging from 30-40 thousand dollars per year. As an employer, ECGC is a source of well paying stable employment in this rural area. ECGC produces 30 thousand tons of garnet from the area annually with 6 million dollars in sales per year. At this rate and assuming future lease approvals, ECGC estimates their reserves at approximately 25 years with a substantial portion being located on USFS lands. (personal communication – Steve Osburn, ECGC)

The current method of garnet mining used by ECGC leaves the larger garnet (greater than 7/16" in diameter) behind in the reclaimed area, essentially preserving the gem garnet resource. ECGC has successfully demonstrated mining and reclamation techniques in the West Fork of Emerald Creek on State and private lands in which the full floodplain deposit is mined and the stream is reconstructed. Photos of the reclamation work at these sites are contained in Appendix A.

The pending lease renewal applications (ID 016415 and 25554) do not entail any proposed mining at this time. Portions of these lease areas have already been mined. (T42N, R1E, Sections 4 and 9)

The pending lease application (ID 29529) for gemstones on Bechtel Butte entails the following: 5 to 6 pits 15 feet in diameter; 1 backhoe trench 100 feet long by 20 feet wide and 8 feet deep on the ridge; a bobcat excavator would be used to fill in and dig smaller trenches (T42N, R1E, Sections 9, 10, 15 and 16).

The pending prospecting permit extension (ID 29619) and prospecting permit applications (ID 31439, 31440, 31441, 31442, 31443, 31444) entail a total of 6 backhoe trenches.

The pending prospecting permit application (ID 33036/ amended application (4/2/2001)) for garnet gemstones entail hand-dug trenches in a tributary to Cat Spur creek. (T42N, R2E, Section 19)

The pending prospecting permit application (ID 32421) for garnet sands on Bechtel Butte entails three hand-dug trenches 10 ft x 12 ft. (T42N, R1E, Sections 9, 10, 15, 16).

Several other small 1 or 2 person seasonal gemstone-mining operations are active and/or being proposed.

The USFS recreational digging site is very popular, attracting thousands of people from all over the U.S. as well as other countries. More information on the recreational digging site can be found in the Recreation section of this EIS. Enforcement of the prohibition of

unauthorized digging in areas outside the designated recreational digging site continues to be an administrative challenge.

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Alternative A

Alternative A would have a negative effect on the world supply of industrial garnet considering that ECGC supplies between 15% and 20% of the world industrial garnet supply off of private, State, and National Forest lands (personal communication – Mike Zientek, USGS – 5/9/2001). The identified likely potential development area along 10,000 linear feet of the Emerald Creek drainage represents 7-10 years of work for ECGC. Although exact reserve estimates for all of the National Forest lands in the project area are not available, these reserves easily represent the major un-mined portion of the best quality industrial garnets in the deposit. This resource would essential be off -limits under Alternative A.

Alternative A would also close down the recreational gem collecting in Emerald Creek Garnet Area. Unauthorized digging would again occur; more law enforcement would be necessary. Environmental damage from unmanaged digging would occur. There is an enormous amount of public support that has been demonstrated over the years. Please refer back to the section titled “Collecting of Garnets” in this Mineral Section for the history and the Recreation Section for effects analysis.

Alternative A would also have a negative effect on the future of the commercial garnet mining industry and thus the local economy in the area. The loss of 50-60 high –paying jobs would have a significant effect on the local economy. Denial of the other permits or lease applications outside of ECGC’s permits would affect these people individually. Other peripheral effects in the economy would be noticed; please see the Recreation Section for further detail.

Alternatives B and C

Alternatives B and C reserve drainages for gem garnet collecting for future rockhounds. In other words, these alternatives include a “no-lease” decision being made for areas of 281 Gulch, Garnet Gulch, Pee Wee Creek, No Name Creek, Strom Gulch, and Wood Creek. These drainages are to be set aside for future public collecting areas. Two to three hundred lineal feet per year would be mined with recreational digging. A Forest Plan amendment would be required for the “no-lease” portion of these areas. The exclusion of these areas from leasing would have a minor negative effect on the overall reserves for industrial garnet sands as they contain less accessible, narrower, and thus less economical deposits of sands. The exclusion of these areas from leasing would have a negative effect on future gem garnet leasing. These areas comprise some of the best-known reserves of gem garnets in the area. However, other portions of the project area contain gem garnets and these areas are being approved for exploration and leasing. These alternatives would approve the exploration for gem garnets through a prospecting permit near Cat Spur Creek and a lease proposal for gem garnet mining near Bechtel Butte. With respect to gem garnet leasing and public collecting,

Alternatives B and C represent a balanced approach ensuring that both commercial leasing and collecting are viable activities in the future. This is consistent with the original intent of the lands being acquired as well as subsequent management direction.

Alternative B would also approve prospecting and exploration activities within the project area for garnet sands. The prospecting permits for ECGC which would likely lead to future lease applications for garnet sand mining being submitted to the USFS for analysis and approval. This alternative would be consistent with the original intent of the lands being acquired and would provide the best situation for future management of the garnet sand resource through the leasing process.

Alternative C would approve prospecting and exploration activities outside of a 30-foot buffer on either side of the East Fork and West Fork for commercial sands. The 30-foot stream buffer restriction would significantly reduce the amount of garnet sand reserves by decreasing the economic viability of many of the narrower garnet sand deposits. This alternative may still lead to future lease applications for garnet sand mining being submitted to the USFS for analysis and approval. This alternative would be consistent with the original intent of the lands being acquired but could potentially have a negative effect on the long-term viability of ECGC and the related local economy.

Recreational digging and potential future mining of sands and garnets is an irretrievable commitment of the garnet resource.

Compliance with Forest Plan

Alternative A is not consistent with Forest Plan standards for minerals and would require a Forest Plan amendment for implementation. Additionally, Alternative A would not meet the original intended purpose of the land acquisition for a significant portion of these lands. Although no specific direction for commercial garnet leasing exists in the Forest Plan, page 8 of the Record of Decision (ROD) for the Forest Plan states that "All lands on the Idaho Panhandle National Forests are available for mineral leasing unless formally withdrawn." The Forest Plan lists Forest-wide standards for minerals on page II-34, which include "Facilitate the exploration and development of critical minerals to the extent practicable, consistent with the protection and management of surface resources." The Emerald Creek Garnet Area Management Plan (Appendix AA of the Forest Plan) provides justification and planning for development of the garnet resource in the area with particular emphasis given to recreational opportunities. Page III-2 of the Forest Plan states "The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience in accord with its current management direction."

Alternatives B and C are consistent with all Forest Plan minerals direction and standards. They provide both commercial and collecting opportunities. These alternatives include a "no-lease" decision being made for areas of 281 Gulch, Garnet Gulch, Pee Wee Creek, No Name Creek, Strom Gulch, and Wood Creek; however, these are to be set aside for future public collecting areas. A Forest Plan amendment would be required for the "no-lease" portion of these areas.

NOXIOUS WEEDS

Regulatory Framework

Noxious weeds are those plant species that have been officially designated as such by federal, State or County officials. The Federal Noxious Weed Act of 1974 defines a noxious weed as "a plant which is of foreign origin, is new to, or is not widely prevalent in the United States, and can directly or indirectly injure crops or other useful plants, livestock or the fish and wildlife resources of the United States, or the public health" (P.L. 93-629). The Idaho Noxious Weed Law defines a "noxious weed" as any exotic plant species that is established or that may be introduced in the State, which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses and is further designated as either a State wide or County wide noxious weed (Idaho Code 24 Chapter 22). Both Federal and State laws define noxious weeds primarily in terms of their competition with commodity land uses. However, the impacts of weeds on non-commodity resources such as water quality, wildlife and natural diversity are gaining increasing attention.

Federal legislation, regulations, policy and direction that require development and coordination of programs for the control of noxious weeds, and evaluation of noxious weeds in the planning process include: the National Forest Management Act (1976); the National Environmental Policy Act (1969); Forest Service Manual Chapter 2080, as amended (USDA, 1995); Executive Order #13112 (February, 1999); Idaho Panhandle National Forests, Forest Plan (1987); the Idaho Panhandle National Forests Weed Pest Management EIS (USDA 1989), and the St. Joe Noxious Weed Control Project FEIS (USDA 1999). In addition, the Federal Noxious Weed Act of 1974 as amended requires cooperation with State, local, and other Federal agencies in managing and controlling noxious weeds. The state of Idaho also requires landowners to control weeds on their property under the Noxious Weed Act, Title 22, Chapter 24 Idaho Code.

Analysis Area

The geographic scope of analysis for noxious weeds in this project is the Stars and Sands Project Area (approximately 20,300 acres of Forest Service land, and 31,800 total acres). This is the largest area upon which a meaningful analysis can be done. Weed populations may expand beyond the project area boundary, but this is not expected to occur to any great extent within the time scale of the project.

Analysis Methods

Disturbed areas often translate into potential weed habitat. Weed species are adept at colonizing recently disturbed areas particularly if light levels increase or the disturbance is located near an infested piece of ground. Once established, most species grow and spread quickly and effectively exclude native vegetation from the site. Analysis will be performed by considering the extent of disturbance associated with activities, potential invading species, and the locations of extant weed populations where possible.

Existing Condition

The St. Joe Geographic Assessment (USDA, 1997) indicates that weeds within the project area are likely present in recently disturbed areas and roads. The full extent of weed infestations within the project area is unknown. Inventories completed for the St. Joe Weed EIS (USDA, 1999) indicate the following populations within the project boundary: spotted knapweed (*Centaurea biebersteinii*), meadow hawkweed (*Hieracium pratense*), and common tansy (*Tanacetum vulgare*) along Road 447; St. John's wort (*Hypericum perforatum*), sulphur cinquefoil (*Potentilla recta*), dalmation toadflax (*Linaria genistifolia*), and spotted knapweed along Emerald Creek; purple loosestrife (*Lythrum salicaria*) and sulphur cinquefoil within the Emerald Creek Grazing Allotment; spotted knapweed and meadow hawkweed along Cedar Creek; houndstongue (*Cynoglossum officinale*) and sulfur cinquefoil in the Keeler Creek Grazing Allotment. Oxeye daisy (*Leucanthemum vulgare*) was also noted during more recent visits to the project area. In the Dutch and Anthony drainages spotted knapweed and St. John's wort are well established on road #1486. CatSpur Creek is heavily infested with St. John's wort.

Weeds were treated in the project area manually and through herbicide spraying in 1998 and 1999. Herbicide spraying was conducted in the vicinity of the project area in 2000. Biological control agents for spotted knapweed were released within the Emerald Creek Grazing Allotment in the spring of 2001. Future weed treatments will be conducted in accordance with the St. Joe Noxious Weed Control FEIS (USDA, 1999).

Environmental Consequences

Direct and Indirect Effects

Alternative A

Under this alternative, recreational digging would continue in 281 Gulch. Tree canopy would not removed and the extent of the disturbance would be limited to around 200-300 linear feet a year, with rehabilitation occurring at the end of the season. Given the shaded nature of the disturbed site and the reclamation that occurs each year, little opportunity for weed colonization exists due to current recreational digging. Potential exists for some colonization due to human foot traffic in and out of the area. However the shaded nature of the site and the immediate yearly rehabilitation make limit this likelihood. Existing populations of weeds within the project area are expected to persist along roads due to more frequent disturbances and higher light levels for longer periods of time than in surrounding forest stands. Here they would provide a seedbank that could spread the species along the road system. Overall, weed numbers will likely gradually increase due to transport of weed seeds and activities on other ownerships.

Alternatives B and C

The direct effect of ground disturbing activities on noxious weeds is to increase the area available for weed colonization. The greatest potential for the establishment of weeds comes from activities that disturb the soil to the greatest extent. Indirect effects of project activities

could be the possible establishment of new weed populations or the expansion of existing populations. The effects from alternative B versus alternative C should be similar. A slightly less amount of land will be disturbed in alternative C along the East and West Forks of Emerald Creek, however this should not result in noticeable differences in weed colonization.

Effects associated with weed population enlargement may include; declines in the palatability or abundance of wildlife and livestock forage, declines in native plant diversity, reductions in the aesthetic value of the landscape, encroachment upon rare plant populations and their habitats, potential reductions in soil stability and subsequent increases in erosion (Lacey et al., 1989), and an overall decline of ecosystem health. The potential for the spread of existing noxious weeds and the introduction of new species exists for all alternatives. Established weed populations along right-of-ways and water courses on National Forest lands may provide a source of seeds for infestation of other ownerships (and vice versa). The possibility for weed establishment can be roughly correlated to the amount of ground disturbing activity and increases in light levels that would take place. The potential for weed spread would be less with the No Action Alternative than for the action alternatives, but existing populations would probably continue to spread due to seed transport by vehicular traffic, cattle, wildlife, and other natural dispersal methods. Design features exist to minimize this threat. Weed control activities within these areas will be scheduled as funding and other priorities allow. Weeds would be treated in the project area on newly disturbed soils and adjacent areas following direction in the St. Joe Noxious Weed Control Project EIS (1999). Without associated weed control methods, weed species are expected to colonize post-disturbance areas and to expand more rapidly throughout the project area as compared to Alternative A.

Cumulative Effects

Alternative A

Cumulative effects are the result of past present and future activities on all ownerships within the area. Current and reasonably foreseeable projects such as the Dutch Cat timber sale, activities such as road work and timber sales associated with the Hidden Cedar project, grazing, mining, and recreational use including garnet digging may result in the creation of new habitat for or transport of noxious weeds. It is expected that the small scale of some activities, built in mitigation measures and the possibility of weed treatments will help to control the spread of noxious weeds. Activities on state and private land in the future are uncertain. The extent of noxious weed control activities on private land in the area is unknown at this time. Lack of weed control and prevention measures by others may contribute to weed expansion. Overall, the effect of all activities is expected to result in the increase in weed numbers within the area over time, especially if control methods are not employed.

Alternatives B and C

Current infestations of noxious weeds are a result of past and current activities in this area. Other federal projects that would affect this area include the proposed project, Dutch Cat timber sale, grazing, and mining. Any ground disturbing activities associated with these projects may result in the creation of new habitat for noxious weeds. Design criteria exist to

limit the spread of weed seed and establishment of new populations, but are not expected to halt such spread completely. In addition, weed control as outlined in the St. Joe Noxious Weed Control EIS projects may potentially occur and would reduce the extent of existing weed populations. Garnet digging and testing is not expected to add to the cumulative effects within the project area. Ground disturbance may occur from hand digging but will be very small in scale. Increases in light levels can play an important role in allowing weed establishment. Testing and digging will not result in an increase in light levels since activities will take place under the existing canopy.

Activities on state and private land in the future are uncertain. Private access requests will likely result in several miles of new road construction in the area. It is also assumed that timber harvest will occur in the area on private and state lands. The extent of noxious weed control activities on private land in the area is unknown at this time.

Even under the no action alternative of the Hidden Cedar project, weed populations are expected to remain stable at best. Other federal activities have built in mitigation to control the spread of noxious weeds. However, given that much of the land in the area project area is not in federal ownership, lack of weed control and prevention measures by others may contribute to weed expansion. The overall effect of all activities is expected to result in the gradual increase in weed numbers within the area over time if control methods are not employed. Such increases may not be discernable within the time frame of this project, and will vary depending upon the extent of disturbances.

Forest Plan Consistency

According to the Idaho Panhandle Forest Plan (1987) direction, infestations of many noxious weed species, including spotted knapweed, meadow hawkweed, and goatweed are so widespread that control would require major programs that are not possible within expected budget levels (Forest Plan, p. II-7). Forest Plan direction is to "provide moderate control actions to prevent new weed species from becoming established. The provisions for minimizing weed spread in Chapter 2 would meet this goal. The No Action alternative would also meet the intent of the Forest Plan.

RANGE

Regulatory Framework

Direction for the management of the range program on Forest Service lands is provided for in several regulations, policies, and laws including: Idaho Panhandle National Forests Forest Plan (USDA,1987), The National Forest Management Act (1976); The National Environmental Policy Act (1969, as amended); Forest Service Manual Chapter 2200, as amended (USDA, 1990a); The Multiple use-Sustained Yield Act (1960); The Federal Land Policy and Management Act (1976, as amended); The Endangered Species Act (1973, as amended); and The Clean Water Act as amended by the Water Quality Act of 1987 (U.S. Congress 1988).

Analysis Area

The geographic scope of analysis for range issues in this project encompasses the Emerald Creek (26,352 acres), Keeler Creek (10,204 acres), and Cat Spur Creek (5213 acres) allotments. Acres were derived from GIS.

Analysis Method

Information was collected from Allotment Management Plans, historic grazing records, permittee files, and the Environmental Assessment for the St. Maries Grazing Allotments (USDA 1999a).

Existing Condition

Vegetation surveys completed in 1998 (located in St. Maries Grazing Allotment EA project file) indicate that the condition of riparian vegetation in the Emerald and Keeler Creek allotments has an upward trend, and that the Cat Spur Creek allotment is stable. These surveys also show that Forest Plan and INFish standards for allowable trampling, level of streambank stability, and streambank vegetation coverage are being met in the Emerald, Keeler, and Cat Spur allotments.

Livestock primarily graze within riparian meadows and use adjacent upland areas for shade and cover. Livestock may alter riparian areas by trampling, rubbing, and browsing riparian vegetation. Removing vegetation, trampling and shearing may affect streambanks and fish habitat (Platts, 1990 check the date). Monitoring for these effects will be done as described in the St. Maries Grazing Allotment Environmental Assessment (USDA, 1999a).

Emerald Creek

Cattle and sheep have grazed in the area of the allotment in the 1920's and 1930's prior to land acquisition by the Forest Service. In 1943 and 1944 sheep were the primary grazers after the Forest Service acquired the land. In 1945 cattle/horse use officially began and has become the only permitted grazing on the allotment. Permitted numbers of stock fluctuated during the early years. Permitted numbers of cattle were 400 cow/calf pairs in 1953 which changed to 368 head in 1968, changed again to 320 head in 1969, and was then reduced in 1972 to 225 head. These numbers were maintained until the Emerald Creek Cooperative Resource Management Area Memorandum of Understanding was signed in 1994. The total number of cow/calf pairs allowed in the allotment was then set at 413, with a total of 41 cow/calf pairs permitted to graze on National Forest lands. Grazing is currently permitted from June 15th to October 15th each year.

The majority of grazing occurs in the lower elevations of the East and West Forks of Emerald Creek and on Willow Creek, although some livestock follow existing roads to the Emerald Butte area and the upper portions of the East and West Fork drainages. Grazing also occurs on Cedar Creek, however this drainage is not included in the project area.

Cat Spur Creek

From 1940 to 1950 this allotment was part of the Keeler Creek allotment and grazed exclusively by 625 sheep annually. In 1950 Cat Spur Creek was split out into its own allotment and allocated for cattle and horse use. From 1950 to 1957, 14 head of cattle were grazed on the allotment. In 1959 this number increased to 50 head of cattle with 14 being permitted to graze on Forest Service land. In 1969 more of the allotment came into Forest Service ownership and stocking levels were set at 50 cow/calf pairs with a total of 26 permitted to graze on National Forest lands. These stocking rates remain in effect currently. Historically primary range within the allotment has been in fair to good condition with an upward trend. Grazing currently occurs between June 6th and October 15th each year. Primary grazing areas occur along Catspur Creek and a portion of these are contained within the project area.

Currently unauthorized digging for garnets currently occurs along a tributary of Cat Spur Creek in T42N R1E Sec 19.

Keeler Creek

The current Keeler Creek allotment boundary was created after the removal of the Cat Spur Creek drainage and the subsequent creation of the Cat Spur Creek allotment in 1950. In general, 625 head of sheep were grazed annually, but numbers were as high as 1,200 in 1958. Keeler Creek was designated as a sheep grazing allotment until 1964 when it changed to cow and horse grazing. Up to 36 head of cattle were grazed on the allotment until 1973. From 1973 to 1993, 52 head of cattle (25 on National Forest land) were permitted to graze within the allotment. In 1993 these numbers were reduced to 21cow/calf pairs in the allotment with a total of 10 cow/calf pairs permitted to graze on National Forest lands. Grazing currently occurs between June 15th and October 15th each year.

Primary grazing areas occur along the West Fork of the St. Maries River, Hidden Creek and Wood Creek. Keeler Creek also contains primary grazing areas, but is not contained within the project area. Currently the permittee grazes only the area around the junction of Keeler Creek and the West Fork of the St. Maries River.

Environmental Consequences

Direct, Indirect, and Cumulative Effects:

Alternative A

There are no known direct or indirect effects from the No Action Alternative. Current stocking levels and grazing practices will continue. Recreational digging in 281 Gulch will continue but is not an area utilized by cattle and therefore will have not effect on grazing.

The cumulative effects of past and present management activities as well as natural random events have been incorporated into the description of existing conditions. Future events

include the likely construction of road on private lands within the project area, in association with other activities. Such activities may open up new areas to grazing.

Alternative B and C

Cat Spur Creek

The Cat Spur Creek Allotment is partially contained within the Stars and Sands project area. Primary grazing areas occur along Cat Spur, Kitten, and lower Log Creeks with only the grass pastures in lower Catspur being contained within the project area. Existing road access to these primary riparian meadows will not change under any alternative. Under this alternative the prospecting permit application for gemstones in T42N R1E Sec 19 would be approved. All digging performed under this permit would be done by hand, and therefore the extent of disturbed ground will be kept small. Unauthorized digging for garnets currently occurs in the same section along a tributary of Cat Spur Creek. This digging is also done by hand. These actions are not likely to affect grazing.

The cumulative effects of past and present management activities as well as natural random events have been incorporated into the description of existing conditions. Approximately 327 acres of the proposed Forest Service Dutch Cat timber sale occurs within this allotment (80 within the Stars and Sand project area). Associated with this timber sale will be approximately one mile of new road construction (approximately ¾ of a mile in the Stars and Sands project area). This road construction will add short extensions to existing roads and will not open up previously unavailable areas to grazing.

Approximately 105 acres of commercial thinning and 5 acres of clearcut harvest could occur within the allotment as a result of activities associated with the Hidden Cedar Project. Harvest would not occur near the primary grazing areas and so chances are low that it will encourage cattle to drift from these areas into new ones. A short (approximately ¼ mile) road would be constructed at the western edge of the allotment in conjunction with a harvest unit. Although the likelihood of cattle utilizing this area is low, should it occur, this road could provide cattle with an easy travel corridor to the adjacent Keeler Creek Allotment.

New road construction associated with private access requests will take place fairly close to primary grazing areas and could provide travel corridors for cattle. Any timber harvest associated with this road building could also provide new transitory range.

Keeler Creek

The Keeler Creek Allotment is partially contained within the Stars and Sands project area. Primary grazing areas exist along lower Hidden, Wood, and Keeler Creeks, and the West Fork of St. Maries River although Keeler Creek does not lie within the Stars and Sands project area. Road access to these areas will not change under this alternative. Wood Creek may be tested for garnets by digging three to fifteen feet deep trenches in the riparian area at approximate 50-foot intervals. All soil removed during trenching would be replaced. The results of the testing may lead to Wood Creek being opened up for recreational digging in the future. This typically results in approximately 100 feet of riparian being hand dug every season. Digging would start at the head of the drainage and work down, and all digging sites would be rehabilitated yearly. There would also be the approval of a pending prospecting

permit application in the upper end of Hidden Creek. This would result in the excavation of a 15x10x15 foot trench which would be filled in immediately. The extent of these disturbances with respects to grazing should be small to nonexistent given their scope and that the permittees cattle currently graze exclusively in the pasture available in the West Fork of St. Maries River and lower Keeler Creek.

The cumulative effects of past and present management activities as well as natural random events have been incorporated into the description of existing conditions. Road construction associated with private access requests will provide more extensive access into some areas than previously existed. It is likely that timber harvest will occur along these routes in the future, which may provide transitory range and encourage cattle use. Timber harvest may occur on Forest Service land in association with the Hidden Cedar Project. The production of transitory range created by timber harvest should be minimal, but may encourage movement of cattle into these units and possibly other units adjoining them. Some road construction may occur in the unit in association with activities outlined in the Hidden Cedar project. However, travel corridors already exist through these areas and for the most part, new Forest Service road construction will just provide alternate access.

Emerald Creek

The Emerald Creek Allotment is comprised of approximately 26,352 acres, the majority of which are contained within the Stars and Sands project area. Primary grazing areas within the allotment are along the West Fork and East Fork of Emerald Creek, Willow Creek, and Cedar Creek. Cedar Creek actually lies outside the Stars and Sand project area boundary as do the primary grazing areas along Willow Creek. Currently 281 Gulch is operating as a recreational dig site. Pee Wee and No Name Creeks were recreational sites in the past and may be opened up again in the future. Garnet Gulch and Strom Gulch will be tested to determine the feasibility of opening these areas to recreational digging. The proposed sites for recreational digging all lie outside of the areas used for grazing and should have no effect on grazing outside of continued vehicular traffic within the allotment. Under the Hidden Cedar Project some new road construction may occur under this alternative in association with timber harvest. Some harvest units may be adjacent to the riparian meadow along the E. Fork o f Emerald Creek and may eventually be used as transitory range.

Cumulative Effects

Common to All Alternatives

Activities proposed in the Hidden Cedar project may have an effect on grazing within the Stars and Sands project area. Timber harvest proposed in many of the alternatives may affect livestock distribution due to the creation of transitory range in openings. Livestock distributions may also change due to new access provided by new roads. All action alternatives have some new road construction associated with them. The movement of cattle on to newly created transitory range or to previously unused areas due to new travel corridors could have detrimental to beneficial effects. Such movement may serve to decrease grazing pressure on riparian areas and reduce overall effects of grazing over a larger area. It may also open potentially sensitive areas to grazing that were previously unused. For further discussion of these effects refer to the St Maries Grazing Allotment EA (USDA, 1999a). The

creation of a fish pond may occur along the western boundary of the Keeler Creek Allotment. Pond construction is not expected to promote changes in current grazing patterns. Other easily accessible water sources exist within the area and so cattle are not expected to congregate at the pond. Riparian planting will occur within the Keeler Creek Allotment. Any fencing placed around these plantings should not remove a large area from grazing.

Consistency With Forest Plan and Laws

Management directive states that "grazing management will protect soil and water resources, riparian areas, and TandE species" (Forest Plan II-7). The Forest Plan standard states that "opportunities for grazing and other uses of public range resources will be managed to serve the welfare of local residents and communities "(Forest Plan II-31). All of the proposed alternatives with requirements for surveys, monitoring and implementation of mitigation measures would meet the intent of the Forest Plan.

RECREATION

Regulatory Framework

Forest Plan

Recreation Goals as identified in the Forest Plan pages II-I and2 include:

1. Provide for the projected use of developed recreation areas. Complete the development of new sites as budget becomes available.
2. Provide for a variety of dispersed recreation opportunities.
3. Provide opportunities for people to be involved in Forest management activities and supply information enabling visitors to better enjoy National Forest lands.
4. Manage special areas for the unique qualities that precipitated their designation: i.e., Wild and Scenic Rivers, Scenic Areas, Botanical Areas, etc.

Recreation Objectives and Standards identified in the Forest Plan pages II-3 and 24 indicate, in part, that the Forest will continue to provide a share of outdoor recreation needs in relation to other public and private entities, provide for the projected use of developed recreation areas with development of new sites as budget becomes available, to provide for a variety of dispersed recreation opportunities, to pursue opportunities to increase and improve the recreation trail system, and to continue and increase cooperative trail programs with organizations, clubs, and other public agencies. Forest Service recreation programs will strive to be complementary with other public and private programs. Off-site interpretation and environmental education will be encouraged. The current level of developed recreation facilities and opportunities will be increased. The increase will be obtained by expansion of existing sites and development of new recreation sites as budget allows. Recreation planning and operations will be coordinated with other federal, state, local, and private recreation managers.

Analysis Area

The geographic scope for the recreational analysis consists of the 31,818 acre project area described in Chapter 1 of the EIS.

The Recreation experience is classified according to the Recreation Opportunity Spectrum as referred to in the IPNF Forest Plan. Forest Plan definitions of Roaded Natural, Roaded Modified, and Rural ROS classes are as follows (Forest Plan, VI-27):

Roaded Natural: A recreation opportunity spectrum class that is characterized by an environment that ranges from natural appearing to a substantially modified nature. This is a roaded area where roads and areas are both open and closed to recreation use. This ROS class is divided into two subclasses. The difference between the two is primarily the physical setting and the user clientele.

> Roaded Natural (RN): A ROS class located along or near main forest roads and highways where the user will find subtle modification to the natural environment. Improvements are limited to roads, trails, few scattered structures and moderately developed campgrounds. The natural environment still dominates although timber harvest activities may be visible.
>
> Roaded Modified (RM): An` ROS sub-class of the Roaded Natural class that is located along less used forest roads where the user will likely encounter large clear cuts and areas where management activities may be present. Chances to get away from other recreation users are increased, but logging activities will be present. A few low standard recreation facilities may be provided.
>
> Rural (R): An ROS class that is characterized by a culturally modified yet attractive environment. This is a roaded area where roads are generally open to recreation use. There will be a high level of interaction between users.

The ROS setting indicators are access, remoteness, size, visual characteristics, site management, visitor management, social encounters and visitor impacts (Project Planning ROS Users Guide Chapter 60, USFS, 1987). For the purpose of determining the ROS classes, roads are classified as either "Primitive" or "Better than Primitive." Primitive roads are generally those where one would not expect to drive a passenger car. Visually they may appear to be two rutted tracks with weeds or grasses growing up between them.

According to the St. Joe District's current Recreation Opportunity Spectrum (ROS) inventory, the Lands within and adjacent to the project area are a combination of Rural, Roaded Natural, and Roaded Modified where a modified environment predominates with some naturally appearing environment. (See project file):

Roaded Natural: 6,862 acres

Roaded Modified: 23,533 acres

Rural Setting: 1,422 acres

The areas where recreational garnet digging is being considered are in 281 Gulch, Garnet Gulch, Pee Wee Gulch, No Name Gulch, Strom Gulch, all of which are within the Roaded

Modified ROS setting, and Wood Creek, the majority of which is in Roaded Modified, with approximately ½ mile on the lower end in the Roaded Natural setting.

The project area is designated in the IPNF Forest Plan as primarily Management Area 1 (MA 1), Management Area 4 (MA 4), and Management Area 5 (MA 5). Management area direction for recreation are identified as:

a) MA 1: Manage primarily for roaded modified and roaded natural Recreation Opportunity spectrum (ROS) classes. Maintain a diversity of recreation opportunities. The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience in accord with its current management direction. (Forest Plan, III-2)

b) MA 4: Manage primarily for roaded modified and roaded natural ROS classes. Motorized use is generally restricted to designated routes. Within critical habitat components motorized recreation use may be restricted to provide needed wildlife security. Maintain a diversity of recreation opportunities. The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience and in accord with its current management direction. (Forest Plan, III-17-18)

c) MA 5: Manage toward roaded natural and semi-primitive ROS experience. Motorized use will generally be restricted to designated routes. Within critical habitat components motorized vehicle use may be restricted to provide needed wildlife security. Provide dispersed recreation opportunities consistent with big game winter habitat needs. (Forest Plan, III-23)

Analysis Methods, Analysis Issues

The Recreation Opportunity Spectrum was used to determine the classifications for the analysis area. An overview of recreational use was developed through on-the-site visits by the Interdisciplinary Team (IDT), recreation and roads personnel, by informal consultations with local residents, and from assumptions made from physical evidence (e.g. a rock fire ring = dispersed camping, meat poles in a dispersed campsite = hunting use). The analysis period for the project is 10 years.

The methodologies in this analysis correspond to the scope of the actions, the risk to the resources, available information, the ability to differentiate effects between alternatives, and the information necessary for an informed decision. The analysis is done at the geographic scale appropriate for the recreation resources, the proposed activities, and the potential for effects.

Existing Condition

Recreation

Camping at Developed Campgrounds

Emerald Creek Campground is located near the junction of Emerald Creek Road 447 and Clarkia-Emerald Road 504. It is located within two miles of the Emerald Creek Garnet Area. Most of the campers using the site are visitors to the Emerald Creek Garnet Area. The

campground was renovated in 1998 – 1999 and is operated as a fee site. There are 18 camp units, water from a hand pump, and three universally accessible vault toilets. The renovated campground includes resurfaced roads and pathways, three concrete accessible toilet buildings, new tables, fire rings and upright grills, signing, a bulletin board and fee station, and expanded parking spurs, family units and tent pads. The campground receives moderate to high use during the spring, summer and fall, with peaks on holidays and on weekends. The current managed season is from Memorial Day weekend through Labor Day Weekend.

Cedar Creek Campground is located adjacent to the project area. Visitors to the Emerald Creek Garnet Area frequently use it. The campground has three overnight campsites and three picnic units. It is located on State Highway 3 along the St. Maries River, approximately 10 miles from the Garnet Area. It was renovated in 1999 – 2000, and will be operated as a fee site in 2001. The campground now includes a universally accessible vault toilet building, resurfaced roads and pathways, new tables, fire rings, signing, a bulletin board and fee station, and three day-use picnic sites with tables and fire rings. The campground has no potable water. The site receives moderate to high use in the spring, summer and fall, filling to capacity on holiday weekends. The current managed season is from May 25 to October 31.

Camping at Undeveloped Sites

Within the project area, there are several undeveloped campsites along roads that receive moderate to high use during the spring, summer and fall. Along Emerald Creek Road 447 there are 13 regularly used dispersed campsites. Most of this use is associated with the Emerald Creek Garnet Area. The site of the old Emerald Creek Garnet Area parking lot, at Pee Wee Gulch, is frequently used as a dispersed camping site for RVs, pickup campers, trailers or tents.

There are numerous other dispersed campsites distributed throughout the project area, including one site on Wood Creek Road 341, four sites along Cats Spur Road 361, one along the East Fork Emerald Road 1489, two sites on Clarkia-Emerald Road 504, 1 along the Emerald Creek Cutoff Road 1487. Use is low to moderate along roads in the interior of the landscape, and the number of dispersed sites has remained fairly static over the past 5 years. The primary camping use of these sites is in the summer and fall.

The Fossil Bowl, a privately owned motorcycle racetrack and fossil-digging site has 6 camping sites with two portable toilets available. The sites include graveled parking spots. No other facilities are provided. Refer to the Recreation Project File.

Recreational Garnet Digging

History

The Emerald Creek Area has long been known as a unique gem collecting area in Northern Idaho. Garnets have been sought in the East Fork of Emerald Creek by rockhounds for many years. Emerald Creek Garnet Area, St. Joe National Forest, also known as Appendix AA to the Forest Plan, describes past use:

"Garnet digging has taken place through the area for many years. Until the spring of 1969, garnet digging throughout the drainage was unrestricted. Digging for the Idaho star garnet outside of the lease areas was restricted for the first time in the spring of 1969.

Before the start of the 1969 field season, an intensive landE [Interpretation and Education] program was launched. Meetings were held with rockhound organizations; news releases were sent to magazines and newspapers; and letters were sent to many rockhound organizations and individuals inquiring about the area. The public was notified that garnet collection was restricted to the existing lease area. Previously unrestricted digging had ripped open drainages without any semblance of control. This caused resource damage as well as creating hazards. Public safety became an important consideration. Rockhounders throughout the area were contacted and informed of the digging restrictions. As was expected, many people were unhappy about being restricted to the existing lease area. A large number of people voiced their dissatisfaction to the Forest Service and their congressional representatives.

In 1969 a request for an additional concession area to be leased was made by the Forest Service. Advertisement of the new lease was made ready by the BLM but canceled because of public and congressional requests. Requests were made by letter and petition requesting the Forest Service be authorized to individually issue permits rather than having another concession in the area.

Proposed agency regulation changes will have the Forest Service administer the area issuing permits for the BLM, thereby achieving the desires of the rockhounders."

The same document also describes Long Range Basic Assumptions, some of which are listed as follows:

- Rockhounding will continue to grow as a family type outdoor recreation.
- Recreation type rockhounding is a valid use of the National Forest and should not be discouraged.
- The needs of the recreation type rock hound can be met by Forest Service administration of the garnet area.
- The highest and best use for the relatively small area used to dig garnets is for recreation type rockhounding.

There was extensive correspondence between the public, gem and mineral clubs, the Northwest Federation of Mineralogical Societies, the Forest Service, the Bureau of Land Management and Senator James McClure about the garnet resources in the East Fork of Emerald Creek. Several public meetings held, one that was attended by 120 participants, to discuss leases, land acquisition and the laws pertaining to the garnet resources. In July 1969, Senator McClure drafted HR 13141, a bill to establish the Idaho Star Garnet National Recreation Area. (Refer to file: 2820 Leases and Permits/2300 Recreation, Emerald Creek Garnet Area – Planning 1960's – 1986.)

A St. Maries Gazette Record newspaper article dated 08/16/73 notes that Ralph Kizer, Forest Supervisor "announced that through the efforts of the Idaho Congressional Delegation, the Department of Interior's mineral regulations have been expanded to authorize the U.S. Forest Service to issue permits for garnet digging in the Emerald Creek Garnet Area after August 13, 1973."

The Emerald Creek Garnet Area opened in May of 1974 in No Name Gulch, operated by the Forest Service. Progressive hand digging proceeded in No Name Gulch and Pee Wee Gulch until 1988, when operations were moved to the current location in 281 Gulch, where progressive digging has occurred for 14 years. In its first full season of operation at Pee Wee Gulch in 1975, there were 1,502 permits sold. Pee Wee Gulch and No Name Gulch were dug over the years, and operations are currently based in 281 Gulch. The average number of permits sold per year between 1995 and 2000 was 1,800. Over the past 27 years of operation, visitors have removed an average of one pound of garnet per permit sold. The Garnet Area receives an average of 3,600 visitors annually, with approximately one half of those visitors purchasing permits to dig for garnets.

Today the Garnet Area continues to be known internationally for its rare star garnets, which are more valuable than star sapphires and star rubies. This is the only site in the United States, and is one of only two places in the world (Idaho and India) where star garnets, are found. The garnet found at the site ranges in size from tiny sand crystals to dodecahedrons (12-sided crystals), the size of golf balls and larger. The fee site is operated by the Forest Service and is open seasonally to the public between Memorial Day weekend and Labor Day weekend for recreational digging of the gem quality garnets, which includes both faceting material and star garnets. There are no other private dig sites available in this area. The Garnet Area is not just a local attraction. Each year visitors travel from every state in the United States and from many countries around the world to enjoy the experience of garnet digging.

The facilities at the parking area include a toilet, bulletin board, a picnic table and signing. The facilities at the digging site include an A-frame administration building which houses displays of garnets and other gems and minerals, two picnic tables and a toilet. Forest Service staff is on site to sell permits, provide information about digging, monitor operations for compliance with rules and safety standards, conduct field trips for groups, and to ensure ongoing stream stabilization and maintenance of sediment ponds.

Visitors to the site vary in age from young children in strollers to senior citizens. The diggers include a wide range of people: casual visitors interested in finding out what a garnet looks like, the hobby rock hounds who plan their vacations traveling across the country from one gem or mineral site to another, families planning a day outing, rock hounds who cut garnets and other stones for sale, and those guided to the site by the special use permittee.

Groups touring the area have included school groups of varying ages, from home school and elementary schools to college field trips for geology and other science courses. YMCA groups, Boy and Girl Scouts, church groups, senior citizen field trips, and students from foreign countries such as Japan have all toured the Garnet Area.

The following is a description of the experience of a visitor to the Garnet Area today:

From State Highway 3, visitors drive 6 miles on gravel Road 447 to the parking lot located on the East Fork of Emerald Creek. A 3-panel interpretive sign provides them information about garnet digging, the railroading history of the area, and includes a map of the garnet area. The diggers carry their tools: a shovel, bucket, rubber boots and a 12-18" square screen box, as well as their lunch and beverage, or tools may be rented at the a-frame administration bulding. A ½ mile gradual uphill hike on a gated road leads them to the a-frame in a small

meadow on 281 Gulch. They pass signs identifying plants and trees along the route. As they approach the a-frame, children often observe small fish, frogs and toads in the sediment-settling pond.

At the a-frame, a Forest Service employee greets the visitors, showing them a display of garnets, garnet jewelry, and other gems and minerals from all over the United States and a series of photos describing the garnet digging process. They explain the process and the permits required for anyone digging, washing or screening for garnets. Visitors just curious to see the digging operations are encouraged to hike to the dig sites and take a look around at no charge.

Rockhounds purchase a permit that costs $10.00 for adults, $5.00 for children age 14 and under. Shovels, buckets, and screen boxes are available for rent for $1.00 each per day, or visitors can bring their own tools. Rock hounds hike ¼ to ½ mile to one of two designated dig sites on the East and West Forks of 281 Gulch. Garnet digging is wet, muddy work. The digging areas are in the streambed and in the adjacent banks. The garnet is found in the mica schist gravels just above bedrock. The depth varies from two to eight feet deep, depending on the overburden. A visitor may start a new hole within the designated area, or may work in a hole previously started. The bucket comes into play here, to bail the water out of the hole, and then digging commences. Forest Service employees demonstrate techniques, and rock hounds dig through a layer of topsoil, a layer of clay, then down to the mica schist gravel layer, just above bedrock, where garnet is found. Material from this layer is shoveled into a screen and carried to a settling pond where it is washed by shaking the screen back and forth, sifting out the dirt and clay and cleaning the gravels so the garnets can be seen. Visitors then sort through the gravels and search out the garnets. This process is repeated as long as the diggers' backs hold up! Most of the better quality garnets are found at or near bedrock, so sometimes quite a bit of digging has to be done before garnet-bearing material can be reached. Ambitious rock hounds have dug as deep as 5-6 feet.

Some rock hounds collect the tiny sand crystals. Most are seeking gem quality garnets ¼ inch or larger, in order to have garnets for jewelry. Garnet is found in veins or in pockets, so visitors may have to move considerable material to find the garnet. The daily permit allows a digger to take up to 5 pounds of garnet. (The average over the past 27 years is just over one pound per person). If they wish to remove more garnet during the same day, they can buy another permit for each additional fire pounds or fraction thereof that is removed. Diggers are limited to six permits or 30 pounds of garnet per year. When finished, the rock hounds hike back to the a-frame building, where their garnet finds are weighed and recorded, then they walk down to the parking area.

Many of the garnets dug will remain with individual families as part of their rock collection. They may have a few stones cut for jewelry and display, particularly if they have found star material. Garnet sands are used in fish bowls, flowerpots and for other decorative purposes. Many of the garnets will find their way to private or commercial lapidary outlets where individuals work the raw stones into finished jewels for sale.

Economic Benefits

There are economic benefits associated with the recreational garnet digging. Tourism connected with the recreational garnet digging provides income to many local businesses.

Grocery, hardware and clothing stores, restaurants, cafes, laundromats, and service stations in Fernwood, Clarkia, Emida, St. Maries and surrounding areas benefit from the business generated by rockhounds visiting the Garnet Area.

Garnet removal and cutting the rare star garnets provides a unique opportunity in the area. Individuals who work the raw material into finished jewels, display garnets, or sell them through commercial means derive financial benefits. Many of the garnets will find their way to commercial outlets and are of direct benefit to lapidary and other commercial business. One web site offers "star garnet rough" material for sale at $20.00 per pound. They list finished 6-ray star garnets for sale at prices ranging from $45.00 for a 3.5ct (carat) stone to $395.00 for an 11.3ct stone.

Social Benefits

The garnet area provides a unique recreational opportunity for families and friends to spend quality recreational time together. Many of the families that dig here include several generations, from young toddlers to grandparents. It is not possible to put a value on the exceptional experience that visitors have at the Emerald Creek Garnet Area. The smiles on the faces of small children who find a chip of garnet, or the thrill of a serious rockhound who discovers a specimen quality garnet crystal cannot be measured.

Comments recorded in the Clarkia Bunkhouse guest register include:

> "We had so much fun digging garnets."
>
> "We found 11 oz. of garnets in 5 hours including one perfect dodecahedron."
>
> "Love it here. Best kept secret around. We took home 11 lbs. of garnets. What a fun time! We hope to return."
>
> "Three days of garnet digging. We had a great time. Keep this gem open for more fun times."

Publicity

Because the star garnet is found only in Idaho and India, the Emerald Creek Garnet Area has received considerable publicity from the media, including segments on regional television programs, numerous newspaper articles each year, and various magazine articles including Lapidary Journal, Sunset Magazine, Travelin' Magazine, Rocks Digest, and National Geographic's "America's Outdoor Wonders: State Parks and Sanctuaries", to name a few. A number of private individuals have created web pages on the internet, some to provide information about garnets, and others to offer cut and polished garnets for sale.

Garnet Area Operations

For 27 years the Garnet Area has opened and operated from Memorial Day weekend through Labor Day weekend.

Each fork of 281 Gulch is being dug progressively, from the upper reaches of the garnet deposits downstream, and is rehabilitated yearly following digging. An estimated 200 – 300

feet is dug in each Gulch annually. Distances vary depending on the number of rock hounds digging and the extent of their digging.

Site preparation occurs the week prior to opening to the public. For the past several years, the West Fork of 281 Gulch, which is non-fish bearing, has opened for digging on Memorial Day Weekend. In preparation, brush is cut, trees and windfalls within the dig site are felled, removed and stockpiled, and employees install straw bale sediment dams in the seasonal stream. Cloth sandbags filled with native material are also used. Sediment ponds and washing ponds are in generally in place from the previous years' rehabilitation work.

Channel alterations (e.g. excavation, water diversion, garnet digging,) do not occur in fish-bearing reaches of the East Fork of 281 Gulch until after spawning is complete. Beginning on July 1, site preparation begins, and the area is opened for the 4th of July holiday. Prior to opening, the stream is routed through a metal irrigation pipe in order to bypass the digging area. Straw bale sediment dams and cloth sandbag dams are installed. A larger settling pond near the A-frame building has a small wooden dam with an opening that can be adjusted for height. In the spring the dam is closed to retain the water and allow suspended sediments to settle before the stream flows over the dam.

Rehabilitation occurs at the end of each season. Depending on the location, it is accomplished either by handwork or with equipment such as a spyderhoe or backhoe. Dug out holes are filled in, the stream is returned to its streambed. Large and small woody debris is incorporated into the rehabilitation. Upon recommendation of the fisheries biologist or the hydrologist, instream structures such as log step-downs may be installed and small pools are created. Planting of trees and shrubs occurs on areas that were rehabilitated in the previous year.

All rehabilitated areas are seeded, fertilized and mulched.

Because of deeper overburden (10-14 feet) in the West Fork of 281, mechanical removal of overburden has been employed for several years to facilitate hand digging by the rock hounds. Excavated materials have been stockpiled for use in rehabilitation on completion of the digging. This work is generally done in the fall when stream flows are low and rubber tired or track equipment can work effectively in the drainages. Any areas exposed are covered by erosion cloth or are seeded and mulched with straw.

Past Emerald Creek Garnet Area operations were located in Pee Wee Gulch and No Name Gulch from 1974 through 1984. Since 1985, the operation has been located in 281 Gulch. Refer to the Recreation Emerald Creek Garnet Area files, for monthly and annual recreation reports.

There has been sporadic unauthorized digging for garnets in various locations within the project area. Employees, volunteer hosts, and law enforcement officers patrol the area to discourage this activity.

Refer to the Minerals section for additional information about the garnet resource.

Recreation Special Uses

A special use permittee guides individuals to the Emerald Creek Garnet Area to dig for garnets. The permittee has operated at the Garnet Area since 1979. Over the past 10 years the permittee has guided an average of 83 diggers per season to the site.

There is currently one permittee who holds a permit for guiding deer hunting in the western portion of the project area. There are presently no designated or reserved outfitter camps within the project area boundaries.

Shorty's Dig

Shorty's Dig is a site that was commercially dredged for garnet sands from 1966 through 1990 by the Emerald Creek Garnet Mill. The site is located approximately 3 miles from the Emerald Creek Garnet Area. In 1966 a lease was granted to Ed "Shorty" Sexton and George Hicks to run a concession for garnet gemstone at the area. Between 1991 and 1995, following completion of the dredging, the site was reclaimed as a wetland in a multi-phased cooperative project between the Army Corps of Engineers, U.S. Forest Service and Idaho State Department of Fish and Game. (Svingen. Dan,XXXX) . Plans are to develop a parking lot and loop trail through the wetland highlighting past activities and to educating visitors about various resource management practices.

Visitor Information Services/Bunkhouse rental

The Clarkia Work Center on State Highway 3 provides visitor information services to the public, serving over 1,200 people in the year 2000. In its first year of operation, the Clarkia Bunkhouse cabin rental program accommodated 112 people over 155 nights.

Day Use/Gathering Forest Products

Day use in the area includes digging for garnets at the Emerald Creek Garnet Area, driving for pleasure and sightseeing, fishing, gathering forest products (huckleberries, mushroom, Christmas trees), firewood collecting, hunting for birds and big game including spring black bear and cougar, and late summer through fall elk, deer and black bear season.

Roads frequently used by visitors and residents include Road 447 (Emerald Creek Road), Road 504 (Clarkia-Emerald), 361 (Cats Spur) 3478 (Bechtel Butte), 1450 (Log Creek), 341 (Wood Creek) and 498 (Hidden Creek) and 765 (Keeler Creek). Refer to the transportation section for further information about the road system.

Fishing

Area residents and other visitors fish the St. Maries River and its tributaries. Use is light.

Fossil Digging

Digging for fossils occurs at the privately owned Fossil Bowl. The owner estimates that on a yearly average 2,400 persons participate in fossil digging, including school groups and individuals.

Motorized Use for Vehicles under 50"

Within the project area, there is very light motorcycle and snowmobile use. The majority of ATV (all terrain vehicle) use is incidental to summer recreational and fall hunting season and occurs along the open roads with mixed vehicle traffic and on roads managed in one of two ways: There are roads that are generally needed for administrative or fire protection purposes with use restricted, usually by a gate, for resource concerns and/or facility protection. The management strategy is to discourage or eliminate motorized public use of the road. The second type of road management is similar, but the use and need for the facility is anticipated to occur at a lower frequency. The road may remain "closed" for a period of 5 to 15 years between uses. Use by vehicles under 50" width may be accepted, discouraged, eliminated or prohibited. ATV use associated with hunting and pleasure riding ranges from low-to-moderate during the spring and summer, remaining moderate on holidays and during fall hunting season.

The privately owned Fossil Bowl offers a developed motorcycle racetrack, with a yearly average of 5,000 persons participating in motorcycle racing.

Trails

There are currently no developed trail systems within the project area. The access road to the Emerald Creek Garnet Area is along the route of the abandoned Trail 281. There are no groomed snowmobile or cross-country ski trails within the area. In general, the area receives very light winter use by snowmobiles and cross-country skiers on existing roads. There is some use by cross-country skiers on Hidden Creek and Wood Creek roads.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

The Recreation Opportunity Spectrum (ROS) classifications would remain the same during the analysis period as described in Chapter III: Roaded Modified for 281 Gulch, No Name Gulch, Pee Wee Gulch, Garnet Gulch, Strom Gulch. The majority of Wood Creek would remain in Roaded Modified, with the lower ½ mile in the Roaded Natural setting.

Public Recreational Gemstone Digging Area By Drainage

281 Gulch: Progressive recreational digging for garnet gemstones would continue in the two forks to the confluence of the East and West Forks. Digging would then continue on the main fork of 281 to Road 447. Overburden removal would be needed.

The West Fork of 281 Gulch would continue to open seasonally on Memorial Day weekend and operate through Labor Day weekend. The East Fork of 281 Gulch would not be entered until after July 1 in order to allow fish spawning, and would operate through Labor Day weekend.

Once recreational digging on the West Fork reached the confluence of the East and West Forks of 281 Gulch, all operations would begin July 1 to allow for fish spawning in the stream. The garnet digging would no longer open Memorial Day weekend. It would operate from July 1 through Labor Day, and, if funding were available, would be open 7-days per week. This would reduce the operating season from the current 75 days to approximately 65 days total operation. School field trips, which traditionally take place in late May and early June, would essentially be eliminated.

Equipment would be used for overburden removal to take overburden down to a depth of approximately 3-4 feet for the diggers, setting aside topsoil for later rehabilitation, providing rockhounds reasonable access to the gemstones by hand-digging and eliminating the safety hazards of deeper holes.

Commercial mining operations may create temporary conflicts between mining and recreation traffic on roads used during proposed mining activities. These roads would be signed to inform visitors of mining activities.

Yearly rehabilitation of the active recreational gemstone digging areas would take place as noted in Chapter 2 and as previously described in Garnet Area Operations. It could include additional planting, in-stream structures or other activities recommended by fisheries or hydrology specialists.

After the current dig areas are depleted, the recreational digging activities would be closed down. Signs and vehicle wheel stops in the parking area would be removed. The existing 281 Gulch parking area would serve as a dispersed campsite. The A-frame and toilet buildings would be removed.

Test hole digging would not occur to determine the extent of gemstone deposits in Garnet Gulch, 281 Gulch, Pee Wee Gulch, No Name Gulch, Strom Gulch and Wood Creek. Drainages that have previously been dug recreationally (Pee Wee, No Name and 281 Gulches) would not be re-entered for future recreational digging. Unauthorized garnet digging would likely continue to occur within the project area.

After digging in 281 Gulch is completed, recreational digging for the Idaho Star Garnet would no longer be available to the public. Recreational activity associated with garnet digging would decrease. School groups would be unable to schedule their end of the school year field trips to the Garnet Area. It is likely that school groups, rock clubs and members of the public would be unhappy or angry at the loss of the sole opportunity to dig for star garnets, resulting in complaints and negative publicity.

Economic benefits would be lost. Stores, cafes, gas stations, laundromats and motels in Fernwood, Clarkia, Emida, St. Maries and surrounding areas would experience a decrease in tourism revenue currently brought in by the rockhounds. Use of the Emerald Creek Campground would decrease, and campground fee receipts would go down. Star garnet material would not be available for commercial interests.

The social benefits of individuals of all ages enjoying this unique recreational experience would be lost. There are no other known areas where gem collectors can dig for star garnets without acquiring a lease. All requests for garnet leases would be denied.

The Forest Service would publish news releases and note on their web page that the recreational gem collecting area was closed. In spite of these efforts, people traveling from all over the world would arrive at the recreational area only to find it closed. With both the recreation dig sites and all commercial leases closed, unauthorized digging for garnets would increase throughout the project area. Additional law enforcement efforts would be needed to patrol and enforce recreational and commercial closures. The abandoned parking lot would be used as a dispersed recreation site. Employees patrolling the area would have to determine whether or not campers in the area were engaged in unauthorized digging for garnets. This pattern would continue for several years.

Problems experienced in the area prior to the 1974 opening of the Garnet Area would resurface. These problems were described in Emerald Creek Garnet Area, St. Joe National Forest, also known as Appendix AA to the Forest Plan:

"Prior to 1969 a large amount of time was spent by rockhounds digging in the side drainages of Emerald Creek. Unsafe and unsanitary conditions existed. Used toilet paper and related materials, lunch wrappers and discarded clothing could be found scattered around the digging sites. Trees were undermined by garnet seekers to possibly later topple in a windstorm. Unsafe trenches and tunnels were built to later collapse or present the unwary with a deep water hazard. At one time dynamite was used which placed others in the area in danger."

Valuable garnet resources would remain in the ground.

Alternatives B and C

The effects to the recreation resource are the same with both these alternatives.

281 Gulch: Recreational garnet digging would continue. The West Fork of 281 Gulch would continue to open seasonally on Memorial Day weekend and operate through Labor Day weekend. The East Fork of 281 Gulch would not be entered until after July 1 in order to allow fish spawning, and would operate through Labor Day weekend.

After recreational digging on the West Fork reached the confluence of the East and West Forks of 281 Gulch, all operations would begin July 1st to allow for fish spawning in the stream. The garnet digging would no longer open Memorial Day weekend. It would operate from July 1 through Labor Day, and, if funding were available, could operate 7-days per week. School field trips, which traditionally take place in late May and early June, would essentially be eliminated.

There is the potential to extend the Garnet Area season beyond Labor Day Weekend through September 30th. This would extend the recreational digging season and provide school groups an opportunity to have field trips during the month of September, however cold, wet or frosty weather is often prevalent after Labor Day. This weather is also a limiting factor in accomplishing the rehabilitation work in the dug areas. Heavy rains or extensive freezing could prevent the use of the spyderhoe or other equipment needed to complete the rehabilitation work.

Test hole digging would occur to determine the extent of garnet deposits in the drainages proposed for future recreation digging (Garnet Gulch, Strom Gulch and Wood Creek), and in drainages previous hand-dug recreationally (Pee Wee, No Name and 281 Gulches). Based on the results, and in conjunction with additional determining information such as access to the deposits, depth of the deposits, ability to remove overburden, cost of trail and facility development and funding available, future recreational gem collecting sites would be prioritized and planned. The drainages that have previously been dug recreationally (Pee Wee, No Name and 281 Gulches) would be re-entered for additional recreational digging.

Equipment would be used for overburden removal to take overburden down to a depth of approximately 3-4 feet for the diggers, setting aside topsoil for later rehabilitation, providing rock hounds reasonable access to the gemstones by hand-digging and eliminating the safety hazards of deeper holes.

Development for future gem collecting sites would include:

Garnet Gulch: The original parking area for Pee Wee and No Name creeks would be used for this drainage. The a-frame building would be relocated to the parking area and a toilet facility installed. An estimated ½ mile of new trail would be constructed. Overburden removal would be necessary.

Pee Wee and No Name Gulches: These drainages were previously dug recreational digging areas and were known to have high quality gemstones. At the time, overburden removal and digging was done by hand. Testing will confirm if there are more resources available. Development would include moving the A-frame to a site near the existing parking area and installing a toilet facility. Existing trails would be reconstructed. Parking barriers and signing would be installed. Overburden removal would be necessary.

Wood Creek: Testing will determine locations of garnet deposits. Road access may need to be improved. A parking lot, signing, and a site for the a-frame and toilet would be developed. Overburden removal may be necessary.

Strom Gulch: Testing will be completed in this drainage. Further development is not foreseen within the next ten years.

Rehabilitation of dug out sites would continue as previously described in Garnet Area Operations.

If the drainages proposed for future development were fish-bearing streams, the Garnet Area season of operation would be July 1 through Labor Day Weekend. The area would be open 7 days per week. The total operating season would be reduced from a 75 days to about 65 days. There is the potential to operate from July 1 through September 30, however some of the difficulties of operating in the month of September are discussed above in Alternative A. The change in the general operating season would create difficulties for school groups trying to schedule field trips at the end of the school year. One respondent expressed: "It is hard to convey the disappointment felt by some families that have saved their money, scheduled their time off to coincide with school breaks and then were unable to look for garnets, because of the conflicts between their schedule and the day that the Forest Service is open."

The economic benefits to local communities through tourism revenue and the social benefits previously described under Existing Condition would continue.

Commercial mining operations may create temporary conflicts between mining and recreation traffic on roads used during proposed mining activities. These roads would be signed to inform visitors of mining activities.

Recreational activities are expected to remain relatively constant, with gradual increases over time. Routine law enforcement patrols would occur to prevent unauthorized garnet digging within the project area.

Valuable gemstone garnet resources would be made available to the public.

Consistency with Forest Plan

Alternative A would not meet the Forest Plan standards or direction for recreation after garnet digging was completed in 281 Gulch. The standards for both Management Area 1 and Management Area 4 state "The Emerald Creek Garnet area will be managed to provide a unique recreation rock hound experience in accord with its current management direction." (Forest Plan, III-2) A Forest Plan amendment may be required to change the standards.

Alternatives B and C would be within Forest Plan Standards for recreation.

SOIL AND WATER

Analysis Area and Cumulative Effects Area

The Stars and Sands area is composed of Emerald Creek and the West Fork St. Maries River (herein after referred to as the West Fork). These two drainages will be analyzed as separate entities and the resulting information will be used for cumulative effects to the downstream reach of the St. Maries River below the Emerald Creek – St. Maries River confluence.

Sediment increases from anthropogenic influences to the St. Maries River system may be felt in the river to the slack water portion backed-up by Lake Coeur d'Alene. Once the stream reaches the slack water section, sediment is deposited due to decreased velocity.

Existing Conditions

Watershed Characterization

The West Fork St. Maries River, including tributaries, is about 36.5 square miles, 10 miles long and flows east and then north from headwater elevations up to 5200 feet. The confluence of the Middle and West Forks of the St. Maries River occur at an elevation of about 2700 feet near the town of Clarkia. Emerald Creek flows east and north in a basin of about 37 square miles, whose confluence with the St. Maries River is about 7 miles north of Clarkia. This area receives about 40-44 inches of precipitation annually. Approximately 87%

of the West Fork basin and 77% of the Emerald Cr. basin is within the 3000-4500 foot contour interval "rain-on-snow" zone (St. Joe GA, 1997.)

Valleys are broad in the lower reaches of the main tributaries and the St. Maries River. Upper reaches have narrow valleys and moderately-steep to steep side slopes. Ridge tops are broad and rounded. Slopes are highly dissected and for the most part heavily vegetated with conifers, shrubs, forbs and grasses. Valley bottoms in lower reaches are meadows utilized for grazing and hay production.

Peakflows on the St. Maries River occur in the spring as a result of rain on snow events or spring snowmelt. Yearly peak discharge, from USGS records, ranges from 780 cfs to 12300 cfs with a median value of 3040 cfs. Discharge for the two-year peakflow (Q2pk) is estimated from Embry (1981). Q2pk for Emerald Creek is estimated at 457 cfs and 490 cfs for the West Fork (above the confluence with the Middle Fork).

Ownership

The USDA Forest Service has jurisdiction over approximately 12,646 acres or 53 percent of the land in Emerald Creek and 12176 acres or 52 percent of the land in the West Fork.

Geology

The general geology for this area is metamorphic sedimentary rock with small areas of granitics and basalt. Valley bottoms are composed of Quaternary alluvium derived from bedrock of the area. The schist and gneiss found in this area weather to fine-grained material.

Activities

Past activities in the two drainages include timber harvest, road building, grazing, homesteads, mining and recreation. All of these activities have the potential to affect soil quality and productivity through compaction, displacement and nutrient transformation and contribute sediment to the stream system. The Emerald Creek Garnet Company mined approximately 1000 acres for garnet sand in the past 60 years (pers. comm. Steve Osburn, Emerald Creek Garnet Co.)

Road Densities

Road Densities are approximately 5 miles per square mile for both Emerald Creek and the West Fork. The value for West Fork does not include decommissioning of roads proposed in Hidden Cedar EIS.

Grazing

There are a total of 413 cow/calf pairs allowed on the Emerald Creek allotment, but only 41 permitted on National Forest lands. There are 21 cow/calf pairs allowed in the Keeler Allotment (10 under USFS permit) and 50 cow/calf pairs in the Cat Spur Allotment (26 under USFS permit) within the West Fork St, Maries River.

Soils

Regulatory Framework

The Idaho Panhandle National Forests' Forest Plan (IPNF, 1987)

Maintain long-term soil productivity: Management activities must not significantly impair long-term soil productivity or produce unacceptable levels of sedimentation from soil erosion. This objective will be accomplished through the use of Best Management Practices (BMPs). Maintain at least 80 percent of an activity area's soils with acceptable productivity potential (no detrimental disturbance, i.e. compaction, displacement, puddling, or severely burned soils) and maintain sufficient large woody debris and nutrient capital to maintain site productivity. Region One's Standard has changed to 85% of an activity area's soils are at an acceptable productivity potential (USDA 2000). The reason for this change is that roads have been taken out of the detrimentally impacted soil category because they are considered committed resources. The Region One Supplement (FSH 2554.1 (11/12/99)) states "The standards donot apply to intensively developed sites such as mines, developed recreation sites, administrative sites or rock quarries."

Analysis Methods

The assessment of environmental effects will focus on 5 factors for the soil resource; erosion, sediment transport, compaction, displacement and productivity. Measurement of effects to the soil resource will consist of area of disturbance for each watershed.

Existing Condition

Soils in the Stars and Sands analysis area are derived from: 1) volcanic ash influenced loess, overlying weakly weathered subsoil and substratum material of residual, mica schist geology, or 2) volcanic ash influenced loess, overlying moderately weathered subsoil and substratum material of residual, metasedimentary Belt geology, or 3) volcanic ash influenced loess, overlying moderate to highly weathered subsoil and substratum material of granitic geology. These values are derived from ARCINFO GIS Landtype coverage. Landtypes are not delineated for private land in the West Fork Emerald and Willow Creek drainages, about 7300 acres, but it is expected to consist of residual belts, schists and alluvium.

Table 3-15 - Landtypes

Soil derived from:	West Fork Acres	Emerald Creek Acres
Alluvium	2022	1090
Residual belt	4061	8201
Residual granitics	6711	2382
Residual schists	10520	4788

High Sensitivity Landtypes

High Sensitivity Landtypes are identified based on surface erosion hazard, sediment delivery efficiency and landslide potential (Project File). There are approximately 6386 acres of Sensitive Landtypes with 2025 in Emerald Creek and 4343 acres in the West Fork. There

are currently about 11 miles of road on sensitive landtypes in Emerald Creek and about 35 miles of existing road in the West Fork.

Mass Movement Potential

High mass movement potential areas comprise 1337 acres in Emerald Cr. and 1026 acres in West Fork. High Sensitivity Landtypes and High Mass Movement areas are displayed on maps in the Project File.

The sensitive landtypes values include roads on private lands. High sensitivity landtypes and high mass movement potential areas are not included for the portion of private land in the West Fork and Willow Creek that are outside the District boundary. Landtypes are not delineated for these portions of private land.

Past Soil Impacts

The IPNF (1998) established a procedure for evaluating detrimental soil impacts from past harvesting activities. This procedure applies to Federal land only. Emerald Creek has 3245 acres of past harvest units (activity acres) and 649 acres with estimated detrimental impacts such as compaction or displacement, for a total of 20% detrimental impacts over the total activity areas. In West Fork, there are 4370 acres of past harvest units (activity acres) and 384 acres with estimated detrimental impacts or 13% of the total activity areas. Regional soil quality standards do not apply to mine locations (USDA Forest Service, 2000.)

Sediment Control

During the recent past garnet sand mining activities in East Fork Emerald Cr. on Forest land in Sections 3 and 4, T42N, R1E, sediment control measures included a 30 foot wide buffer from the creek, a sediment berm 2-3 feet tall, silt fencing and straw bale catch basins, settling ponds, and dry-pit mining. Sampling for suspended sediment was conducted above and below operations at this site in 1992, 1993 and 1994. No significant difference was found between suspended sediment levels above or below the mining site (Hallisey, 1994, Project File). Sediment control measures on the recreational dig site include sediment catch basins, seeding and mulching or covering with erosion control blankets.

Past Mining Rehabilitation Work

From personal examination of rehabilitation of sites within 281 Gulch of the recreational extraction sites the effort appears successful with good vegetative cover and no significant erosion – no rill, gullies or sheet erosion noted. Rehabilitation efforts of the Emerald Creek Garnet Company also appear successful from personal examination of sites in the East, West and main Emerald Creek. In the upper West Fork Emerald Creek where channel relocation occurred some bank erosion is occurring where vegetative recovery is not yet complete. Wetland reestablishment is exemplary. My qualitative estimation is that site recovery is about 95% of pre activity levels. See photographic exhibit (Appendix A).

Environmental Consequences

Direct and Indirect Effects

Alternative A

Recreational Gemstone Extraction

West Fork 281

There is ongoing gemstone extraction in the West Fork and East Fork of 281 Gulch. A large portion of the overburden was removed at the site in the West Fork 281 Gulch in the fall of 2000. It is estimated that 400 cubic yards were removed and stockpiled nearby. Overburden removal was deemed necessary because of safety issues for the recreational digging. An additional 900 cubic yards are scheduled for overburden removal in the fall 2001.

East Fork 281

The level of disturbance in the East Fork 281 Gulch is about 150' by 25' or 0.09 acres and in the West 281 Gulch about 250' x 35' or 0.20 acres. High mass failure potential has been identified from the IPNF's landtype map for the 281 Gulch in areas adjacent to the recreational dig site. The activity in 281 Gulch will continue until the deposits are exhausted or the dig site reaches FDR 447, the East Fork Emerald Creek Road. This entails a distance, from the current site, of 1500 feet downstream.

Sediment basins, straw bale sediment traps and a dam with settling pond are currently utilized for sediment reduction to the stream system from this recreational operation. Any instream basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

These areas are treated in the fall with straw mulch or erosion control blankets if the area will be entered again the next season. If the area is not going to be re-entered, reclamation of the site would proceed following design criteria of Chapter 2 and Idaho mining BMPs.

The level of annual disturbed area for this gemstone extraction is approximately 0.2 acre (250' x 35') in the West Fork 281 and 0.09 acre (150' x 25') in the East Fork 281. Once digging begins in the main stem of 281 (below the Forks) the disturbed area would be about 0.1-0.15 acres per annum.

Common to Alternative B and C

Direct effects from the recreational dig in 281 Gulch is removal of garnet gemstones, increased turbidity at the site and downstream, soil horizon mixing, displacement of soil from the dig site to downstream areas (during cleanout from sediment basins to the floodplain adjacent to the basin), and vegetation removal. This activity may cause entrainment and

subsequent deposition of an estimated 0.1 cubic yards of fine material (<2mm) into downstream reaches. Disturbance levels are displayed under the Measurement section above. Removal of the toe of the hill slope during overburden removal increases the risk of mass failure.

Indirect effects include downstream impacts from the increased sediment; increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms, and possible weed introduction on disturbed sites.

There is ongoing gemstone extraction in 281 Gulch – in both the West Fork and East Fork. A large portion of the overburden was removed at the site in the West Fork 281 Gulch in the fall of 2000. It is estimated that 500 cubic yards were removed and stockpiled nearby. Overburden removal was deemed necessary because of safety issues for recreationists. An additional 900 cubic yards are scheduled for overburden removal in the fall 2001. The level of disturbance in the East Fork 281 Gulch is about 150' by 25' or 0.09 acres and in the West 281 Gulch about 250' x 35' or 0.20 acres. High mass failure potential has been identified for the 281 Gulch in areas adjacent to the recreational dig site on the IPNF's landtype map. The activity in 281 Gulch will continue until the deposits are exhausted or the dig site reaches FDR 447, the East Fork Emerald Creek Road. This entails a distance, from the current site, of 1500 feet downstream.

Sediment basins, straw bale sediment traps and a dam with settling pond are utilized for sediment reduction to the stream system from this recreational operation. Any instream basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

The level of annual disturbed area for this gemstone extraction is approximately 0.2 acre (250' x 35') in the West Fork 281 and 0.09 acre (150' x 25') in the East Fork 281. Once digging begins in the main stem of 281 (below the Forks) the disturbed area is estimated at 0.1 to 0.2 acres per annum.

Direct and Indirect Effects

Alternatives B and C

Direct effects from the recreational dig in 281 Gulch is removal of garnet gemstones, increased turbidity at the site and downstream, soil horizon mixing, displacement of soil from the dig site to downstream areas (during cleanout of sediment basins) and vegetation removal. This activity may cause entrainment and subsequent deposition of an estimated 0.1 cubic yards of fine material (<2mm) into downstream reaches. Disturbance levels are displayed under the Measurement section above. Removal of the toe of the hill slope increases the risk of mass failure.

Indirect effects include downstream impacts from increased sediment – increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms, and possible weed introduction on disturbed sites.

Recreational Exploration

Exploration sites are proposed on Wood Creek, Garnet Gulch, Pee Wee, No Name and Strom Creeks for determination of gemstone reserves. This consists of digging sample holes with augers, hand tools or mechanical hoes (back hoe, excavator). The garnet resource would be identified within these trenches or holes and then they would be filled with the same excavated material. Reclamation for trenches is described in soil and water design criteria in Chapter 2. It is recommended that the number of exploration sites be kept at the minimum number possible to limit the amount of disturbance. Up to 60 auger holes, hand- dug pits or machine –dug trenches have been estimated, my recommendation is a maximum of 20 machine- dug trenches.

Maximum disturbance with 60 mechanical exploration trenches: Each trench would be about 5 feet by 15 feet. The level of disturbed area for this gemstone exploration is approximately 0.1 acre per drainage. If the recommended level of 20 sites are explored the level of disturbance would be about 0.03 acre per drainage.

Commercial Exploration

Prospecting sites are proposed in the following watersheds: East Fork Emerald Creek, Bechtel Creek, Cat Spur Creek and Hidden Creek.

There are three exploration sites on Bechtel Butte that consist of hand-dug trenches approximately 10 ft. by 12 ft. each. Hand dug exploration pits or trenches are also proposed in Cat Spur. Each trench would be reclaimed before beginning the next prospecting pit. Reclamation for trenches is described in soil and water design criteria in Chapter 2.

Exploration at sites within the other drainages will occur in floodplain or terrace locations. Trenches are dug with an excavator and will vary in size, but are generally 10-15 feet deep, 5 feet wide and about 15 feet long. Location of sites would follow design criteria, and the reclamation for trenches is described in soil and water design criteria in Chapter 2.

East Fork Emerald floodplain-terrace location: 0.005 acre (2 sites @ 5 ft. by 20 ft.)

West Fork St. Maries River.

Cat Spur Creek: estimated 0.014 acre (5 sites @ 10 ft. by 12 ft.)

Hidden Creek floodplain-terrace location: 0.002 acre (1 site @ 5 ft. by 20 ft.)

Bechtel Creek floodplain-terrace location: 0.005 acre (2 sites @ 5 ft. by 20 ft.)

Bechtel Butte: 0.01 acre (3 sites @ 10 ft. by 12 ft.)

Commercial Gemstone Extraction

Issue a lease for gemstone extraction on Bechtel Butte. Proposed disturbance is 9-15 pits, each with a diameter of 15 feet; a trench 100 ft. by 20 ft. by 8 ft. deep and other smaller trenches.

Bechtel Butte: 0.05 acre (1 site @ 20 ft. by 100 ft.)

Bechtel Butte – ridge location Emerald Creek side: maximum 0.06 acre (15 sites @ 15 foot diameter).

Direct and Indirect Effects

Common to All Action Alternatives

Direct effects from the above exploration activities and commercial gemstone extraction are vegetation removal; soil horizon mixing; removal of garnet sands and gemstones; decreased resistance to erosion from vegetation removal, both at the surface (loss of vegetative cover) and subsurface (loss of root strength); and possible soil compaction from excavator or back hoe. Disturbance levels are displayed above.

Indirect effects from the above exploration activities and commercial gemstone extraction may include surface erosion before vegetation becomes reestablished and weed introduction. For sites on Bechtel Butte some down slope soil movement may occur, but no delivery to the stream system is expected because of an adequate vegetative buffer. Because of the minor areal disturbance, vegetative buffers and flat terrain sediment movement is not expected, therefore sediment transport to the stream system from exploration on terraces or floodplains is not likely to occur.

Potential Development

If exploration identifies sufficient reserves of garnet sands then development of these mineral resources could occur if extraction and production costs are economically viable. If exploration of the gemstone reserves for recreational digging identifies reasonable quantities then development will occur.

Development of Recreational Gemstone Extraction: Effects from this activity are the same as those listed above for the current digging in 281 Gulch. Disturbance levels will be about 0.2 acres or less per drainage per annum. Introduced sediment will need to be removed from the stream system.

Commercial Garnet Sand Development: A large area may be considered for lease, which includes portions of Emerald Creek, West Fork (St. Maries) and Hidden Creeks.

Approximately 10,000 lineal feet of the East Fork Emerald Creek may be utilized for sand extraction, from the confluence of the East and West Forks Emerald Creek upstream to the confluence with Flat Creek Per map provided by Emerald Garnet Co.) Some of the valley bottom of the East Fork is too narrow for economic viability and that is also the case in the Little East Fork of Emerald Creek, which will not be disturbed for sand extraction (Steve Osburn, Emerald Creek Garnet Co. Pers. Comm.). If this length were utilized over a five-year

time frame about 2,000 lineal feet of channel, or over ten years 1,000 lineal feet would be mined per year. I estimate a lineal disturbance level of 2000-6000 feet of streambank per annum. Any level of stream course alteration would be reclaimed within the same year, prior to snowfall and before moving to the next site.

The level of annual disturbance and effects from the potential sand extraction *can only be estimated at this time.* Once the mining Plan of Operation is developed, site-specific effects and level of disturbance will be assessed.

Alternative B

Because the potential mining of garnet sands under Alternative B would utilize the whole valley bottom, the stream channel will be moved. This activity is expected to increase sediment in downstream reaches because of entrainment of fine material from a new location and erosion of streambanks before stabilization occurs. This increased level of sediment is not expected to be long-term. The rehabilitation of the valley and stream channel includes a generous attempt to revegetate the disturbed sites including shrub transplants to steam banks (see photo appendix of rehabilitated sites). Between 2,000 and 6,000 lineal feet of streambank may be altered and then reconstructed.

Alternative C

A 30-foot buffer to streambanks is implemented in Alternative C for the commercial sand operation. Therefore no streambank disturbance will occur in commercial activities under this alternative.

Commercial garnet sand extraction is not expected to increase sediment in the stream system because of the 30-foot buffer to the stream channel. A suspended sediment sampling analysis found no significant difference in sediment levels above or below the Garnet Mining Company's site in 1992-1994 (Hallisey, 1994, Project File). The level of annual disturbance and effects from the potential sand extraction can only be estimated at this time. Once the mining Plan of Operation is developed, effects and level of disturbance can be assessed. It is estimated that 1,000 to 3,000 feet of valley bottom will be affected per season.

Cumulative Effects

<u>Alternative A</u>

Recreational digging is expected to increase the level of sediment in the East Fork and main stem Emerald Creek. Combined with sediment generated from roads and other activities (grazing, private land mining and timber harvest (see fish report for listing of past, recent and future activities)) may result in increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms. Soil compaction and productivity are not expected to change form the continued operation of the recreational digging, because the areas are rehabilitated. Some soil displacement will occur as evident in the water samples from 281 Gulch tested for suspend sediment. But with the use of a suction dredge and removal of the estimated amount of sediment entrained from the digging operation no increased cumulative impact is expected.

Alternatives B and C

Alternative B would have greater cumulative effects than Alternative C because of the channel and stream bank alterations. Some soil displacement will occur as evident in the water samples from 281 Gulch tested for suspend sediment. From recreational digging an increased level of sediment in the East Fork and main stem Emerald Creek. Combined with sediment generated from roads and other activities (grazing, private land mining and timber harvest (see fish report for listing of past, recent and future activities)) may result in effects to beneficial uses because of increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms. But with the use of a suction dredge and removal of the estimated amount of sediment entrained from the digging operation no increased cumulative impact is expected. No significant effect to soil productivity is expected because of the small extent of activity and stockpiling of topsoil. Compaction and displacement are not expected to occur because the excavated material is returned to the site where it came from. Erosion is not expected to be significant because of the small areal extent of the explorations and gemstone mining on Bechtel Butte and implementation of the design criteria in Chapter 2.

Consistency with Forest Plan and Other Laws and Regulations

The IPNF Forest Plan direction for soils will be met because soil productivity is not expected to change if the design criteria of Chapter 2 are followed, which includes applicable BMPs. Objectives under the Clean Water Act will also be met if the design criteria are followed and the suction dredge is used to remove entrained sediment. Suspended sediment sampling will determine the amount from the recreational extraction of gemstones.

Water

Regulatory Framework

The Idaho Panhandie National Forests' Forest Plan (IPNF, 1987)

Maintain water quality to meet or exceed State Water Quality Standards: To help accomplish this objective, BMPs must be applied to management activities. Monitoring efforts must focus on the implementation of BMPs and their effectiveness in protecting water quality. Water quality that is below Forest standards must be improved through restoration projects and through scheduling of timber harvest and road building activities.

Manage resource development to protect stream channel integrity: Manage riparian areas to meet objectives for dependent resources (fish and wildlife habitat, water quality, stream channel integrity, and vegetation) while producing other resource outputs.

INFISH Forest Plan Amendment

Standards for managing riparian areas were established as Forest Plan Amendments based on the Inland Native Fish Strategy (1995), commonly referred to as INFISH. Riparian Habitat

Conservation Areas are determined for watersheds and essentially promote water quality benefits through stream shading, vegetative buffers for sediment control, and channel stabilizing features of woody debris and streambank vegetation.

Clean Water Act

A declared objective of the Clean Water Act (33 U.S.C. 1323) is to "...restore and maintain the chemical, physical, and biological integrity..." of streams (U.S., 1988). The CWA directs the Forest Service to meet state substantive and procedural requirements respecting control and abatement of pollution. Through a Memorandum of Understanding with the State of Idaho (IDWR, 1993), the Forest Service is responsible for implementing nonpoint source pollution control and the Idaho Water Quality Standards (IDAPA 16.01.02) on National Forest System lands. Forest Service water quality policy is to; promote the improvement, protection, restoration and maintenance of water quality to support beneficial uses, promote and apply approved Best Management Practices (BMPs) to control non-point source pollution, comply with state and national water quality goals, and design monitoring programs for specific activities and practices that might affect in-stream beneficial uses (IDWR, 1993).

Water Quality Limited Segments

Emerald Creek, the West Fork St. Maries River and the main stem St. Maries River below Clarkia are listed on Idaho's 1998 list of Water Quality Limited Water Bodies (303(d) list). These stream reaches are not supporting their beneficial uses or are below water quality standards. The pollutants of concern are temperature and sediment for the West Fork, and nutrients, habitat alteration and sediment for the main stem St. Maries River. Sediment, habitat alteration and temperature are pollutants of concern in Emerald Creek from the confluence of the East and West Forks to its mouth. All of these water bodies are scheduled for Total Maximum Daily Load (TMDL) determination in the year 2002.

Idaho Water Quality Law

The State of Idaho established the Idaho Water Quality Law (§39-3601 et. seq.), water quality standards (IDHW, 1996) designed to protect beneficial uses, and an Antidegradation Policy (§39-3603) which directs that existing uses and the level of water quality necessary to protect those uses must be maintained and protected.

Designated beneficial uses for the St. Maries River below the confluence of the West and Middle Forks to Carpenter Creek are Cold Water Aquatic Life, Primary Contact Recreation, Domestic Water Supply and Special Resource Water designations and below Carpenter Creek Cold Water Aquatic Life and Primary Contact Recreation (IDAPA 16.01.02.110.11; IDHW, 1988). The West Fork and Emerald Creek are Undesignated Surface Waters (IDAPA 16.01.02.101.01); existing beneficial uses are aquatic life (cold water biota), and primary or secondary contact recreation (IDAPA 16.01.02.101.01.a).

Analysis Methods

The assessment of environmental effects will focus on three for the water resource; water quality (including pollutants), water quantity and timing and beneficial uses and stream channel integrity. .

The determination of environmental consequences from issuance of a lease and commercial extraction of garnet sand can only be fully assessed once a Plan of Operation is submitted – the assessment that follows for commercial sand extraction is only an estimate.

Existing Condition

Stream Channel Integrity

Stream channel conditions and effects are assessed for Emerald Creek, individual tributaries where activities are proposed and cumulative stream channel effects are assessed downstream through the St. Maries River.

Stream channel integrity means that channel form (type) is representative of discharge and sediment yields. Comparison of the existing type to what might be naturally expected. Fundamental to this discussion are channel types, response potential, and cause-effect evaluation. The channel types referred to here are from Montgomery and Buffington (1997) and Rosgen (1994). Sediment and water yield predictions are evaluated against channel response potential and cause-effect linkages to indicate a potential for compromising stream channel integrity.

Channel Types

Emerald Creek

Emerald Creek has been modified from past mining activities, road construction and vegetation modification. Cedar trees and stumps of considerable size are evident along some portions of the creek, mostly above the confluence of the West and East Forks. The channel discussion for Emerald Creek will focus on the East Fork and one small tributary of the West Fork Emerald Cr. because this is where proposed activities will occur and very little land is under Federal jurisdiction in the W. Fk. Emerald Cr. or in Willow Creek.

The East Fork of Emerald Creek is predominantly a low gradient “C” channel or moderate gradient “B” channel (Rosgen, 1994). The channel currently exhibits low sinuosity perhaps due to road location in the riparian area, vegetation manipulation, past mining activities, railroad spur construction up the drainage or combinations of these activities. Above the Little East Fork Emerald confluence beaver activity is creating a braided channel pattern in some areas and creating dams that are nominally acting like steps. Past log weir placements have improved habitat conditions through creation of pool, cover and bank protection.

Rock riprap is in place on at least two outside meander bends to protect road fill from the erosive force of annual high flows.

West Fork

In the Rosgen (1994) classification system, the channel of the West Fork St. Maries River is an incised low gradient "F" and meandering low gradient "C" in lower elevations and low sinuosity moderate gradient "B" channels in upper reaches. In the Montgomery and Buffington (1997) classification, upper reaches classify as colluvial, cascade, step-pool to forced pool riffle, and pool riffle in lower reaches. Tributaries of the West Fork like Hidden, Maize and Wood Creeks have Rosgen sinuous low gradient "E" channels in the lower reaches, transitional "C" channels and "B" channels in the upper reaches; and in the Montgomery-Buffington system, pool riffle and forced pool riffle in lower reaches and cascade, step pool and forced pool riffle in upper reaches.

In the lower reaches of St Maries River, channel types are predominately Rosgen "F" and "C." These are alluvial pool-riffle channels under Montgomery and Buffington (1998; 1993) classification. Alluvium ranges from fine sands and silts to gravels and cobbles. This material is transported and resorted at high discharges, although flows at or near the average annual peak (QF2P at bankfull or less) do not appear to cause significant mobilization and redistribution. Upper reaches are predominantly Rosgen "B" or "E" channels, or cascade, step-pool or forced pool-riffle under Montgomery and Buffington's classification.

Existing conditions are evaluated in terms of water and sediment yield characteristics and their relationship to current and potential natural channel form. Cascade and step-pool reaches are considered transport segments that are morphologically resilient because they can rapidly convey increased sediment and discharge; pool-riffle reaches are response segments whose channels may incur significant morphological adjustment in response to increases in discharge or sediment (Montgomery and Buffington, 1997.) The lower reaches of the West Fork and main stem of the St. Maries River are adjusting to riparian and watershed vegetative changes from harvest activities that limit amounts of large organic material that normally stabilize stream channels; and other activities like mining, grazing and fires that reduced stabilizing streamside vegetation, especially the deep-rooted shrub component. The tributaries of the West Fork appear to be transporting their sediment and discharge without excess alterations to stream channels. Lateral channel migration is occurring in some areas, but this is expected in Rosgen "F" and "C" channel types.

Past Restoration Activities

Emerald Creek

14 acres of Riparian planting were completed in 1992 and another 3 acres in 2000 on the East Fork Emerald Creek (East Fork). Two areas of past garnet mining (about 11 acres) were rehabilitated in 1990 and 1995-1998. Twenty sediment traps were installed on tributaries (associated with clearcuts) of the East Fork in 1993. A past garnet mining site of about 20 acres near the Emerald Creek campground was rehabilitated in 1966 (see photo exhibit). Approximately 15 aquatic habitat enhancement structures were placed in East Fork Emerald Creek (1993).

West Fork St. Maries River

Keeler Creek Road decommissioning, 2000; Road obliteration and stream crossing rehabilitation associated with the Clarkia Woods TS; Past obliteration (approximately 1.5 miles) and stream crossing removals on FDR's 3499 and 341 in Wood Creek, and FDR 3340A in Bechtel Creek (approx. 1 mi.); ERFO repairs from flooding in 1996 – approximately 10 sites in Emerald Creek and 6 in the West Fork.

Environmental Consequences

Direct and Indirect Effects

Alternative A

RECREATIONAL GEMSTONE EXTRACTION: There is ongoing gemstone extraction in 281 Gulch – in both the West Fork and East Fork. A large portion of the overburden was removed at the site in the West Fork 281 Gulch in the fall of 2000. It is estimated that 500 cubic yards were removed and stockpiled nearby. Overburden removal was deemed necessary because of safety issues for recreationists. An additional 900 cubic yards are scheduled for overburden removal in the fall 2001. The level of disturbance in the East Fork 281 Gulch is about 150' by 25' or 0.09 acres and in West 281 Gulch about 250' x 35' or 0.20 acres. High mass failure potential has been identified for the 281 Gulch in areas adjacent to the recreational dig site on the IPNF's landtype map. The activity in 281 Gulch will continue until the deposits are exhausted or the dig site reaches FDR 447, the East Fork Emerald Creek Road. This entails a distance, from the current site, of 1500 feet downstream.

The level of annual disturbed area for this gemstone extraction is approximately 0.2 acre (250' x 35') in the West Fork 281 and 0.09 acre (150' x 25') in the East Fork 281. Once digging begins in the main stem of 281 (below the Forks) the disturbed area would be about 0.1 to 0.2 acres per annum.

Direct effects from the recreational dig in 281 Gulch is removal of garnet gemstones, increased turbidity at the site and downstream, soil horizon mixing, displacement of soil from the dig site to downstream areas (during cleanout of sediment basins) and vegetation removal. This activity may cause entrainment and subsequent deposition of an estimated 0.1 cubic yards of fine material (<2mm) into downstream reaches. Disturbance levels are displayed under the Measurement section above. Removal of the toe of the hill slope during overburden removal increases the risk of mass failure.

Indirect effects include downstream impacts from the increased sediment – increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms, and possible weed introduction on disturbed sites.

Water Quality – Sediment

Sediment basins, straw bale sediment traps and a dam with settling pond are utilized for sediment reduction to the stream system from this recreational operation. Any instream basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may

be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

Water Quality – Other Pollutants

No change in water quality is expected. No change in any chemical concentration is expected from this activity because no introduction of chemicals is anticipated.

Accidental fuel or oil spills are always a possibility, but emergency spill equipment should be available where equipment is operating. A physical parameter like temperature is not expected to change because no significant change in stream shading will occur.

Water Quantity and Timing

No change is expected to water yield or timing because no significant change in vegetative cover would occur from this activity. Significant changes in vegetative cover may influence melt rates (Packer) and water yield if over 20% (Stednick).

Beneficial Uses

Pollutants of concern for downstream reaches that are listed as WQL Segments include: nutrients, temperature, sediment, and habitat alteration. No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases are not expected because of no significant change in vegetative cover; and though some sediment increase is expected, the use of a suction dredge is proposed to remove any introduced sediment from nearby downstream reaches, to remain within the policy of no net increase in pollutants that are inhibiting full attainment of beneficial uses; habitat alteration would not be increased in downstream reaches because introduced sediment would be removed and no increase in water yield is anticipated.

Stream Channel Integrity

Compromise to stream channel integrity is not expected because no net increase in sediment (introduced sediment would be removed by suction dredge) or water yield (no change in cover or melt rates) would occur from these activities.

Cumulative Effects

Alternative A is not expected to impact water quantity or timing, stream channel integrity, chemical pollutants in the streams (as discussed above); but may further impair the beneficial uses through sediment introduction, unless suction dredges are used for removing introduced sediment.

Alternatives B and C

Recreational Gemstone Extraction

There is ongoing gemstone extraction in 281 Gulch – in both the West Fork and East Fork. A large portion of the overburden was removed at the site in the West Fork 281 Gulch in the fall of 2000. It is estimated that 500 cubic yards were removed and stockpiled nearby. Overburden removal was deemed necessary because of safety issues for recreationists. An additional 900 cubic yards are scheduled for overburden removal in the fall 2001. The level of disturbance in the East Fork 281 Gulch is about 150' by 25' or 0.09 acres and in West 281 Gulch about 250' x 35' or 0.20 acres. High mass failure potential has been identified for the 281 Gulch in areas adjacent to the recreational dig site on the IPNF's landtype map. The activity in 281 Gulch will continue until the deposits are exhausted or the dig site reaches FDR 447, the East Fork Emerald Creek Road. This entails a distance, from the current site, of 1500 feet downstream.

The level of annual disturbed area for this gemstone extraction is approximately 0.2 acre (250' x 35') in the West Fork 281 and 0.09 acre (150' x 25') in the East Fork 281. Once digging begins in the main stem of 281 (below the Forks) the disturbed area would be about 0.1 to 0.2 acres per annum.

Direct effects from the recreational dig in 281 Gulch is removal of garnet gemstones, increased turbidity at the site and downstream, soil horizon mixing, displacement of soil from the dig site to downstream areas (during cleanout of sediment basins) and vegetation removal. This activity may cause entrainment and subsequent deposition of an estimated 0.1 cubic yards of fine material (<2mm) into downstream reaches. Disturbance levels are displayed above. Removal of the toe of the hill slope during overburden removal increases the risk of mass failure.

Indirect effects include downstream impacts from the increased sediment – increased fine material in the streambed, possible pool filling, possible decrease in aquatic organisms, and possible weed introduction on disturbed sites.

Water Quality – Sediment

Sediment basins, straw bale sediment traps and a dam with settling pond are utilized for sediment reduction to the stream system from this recreational operation. Any instream basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

Water Quality – Other Pollutants

No change in water quality is expected. No change in any chemical concentration is expected from this activity because no introduction of chemicals is anticipated.

Accidental fuel or oil spills are always a possibility, but emergency spill equipment should be available where equipment is operating. A physical parameter like temperature is not expected to change because no significant change in stream shading will occur.

Water Quantity and Timing

No change is expected to water yield or timing because no significant change in vegetative cover would occur from this activity. Significant changes in vegetative cover may influence melt rates (Packer); and increase water yield if over a 20% reduction (Stednick).

Beneficial Uses

Pollutants of concern for downstream reaches that are listed as WQL Segments include: nutrients, temperature, sediment, and habitat alteration. No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases are not expected because of no significant change in vegetative cover; and though some sediment increase is expected, the use of a suction dredge is proposed to remove any introduced sediment from nearby downstream reaches, to remain within the policy of no net increase in pollutants that are inhibiting full attainment of beneficial uses; habitat alteration would not be increased in downstream reaches because introduced sediment would be removed and no increase in water yield is anticipated.

Stream Channel Integrity

No compromise to stream channel integrity is expected because no net increase in sediment (introduced sediment would be removed by suction dredge) or water yield (no change in cover or melt rates) would occur from these activities.

Recreational Exploration

Exploration sites are proposed on Wood Creek, Garnet Guich, Pee Wee, No Name and Strom Creeks for determination of gemstone reserves. This consists of digging sample holes with augers, hand tools or mechanical hoes (back hoe, excavator). The garnet resource would be identified within these trenches or holes and then they would be filled with the same excavated material. Reclamation for trenches is described in soil and water design criteria in Chapter 2. It is recommended that the number of exploration sites be kept at the minimum number possible to limit the amount of disturbance. My recommendation is a maximum of 20 machine –dug trenches.

Maximum disturbance with 60 mechanical exploration trenches: Each trench would be about 5ft. by 15 ft. The level of disturbed area for this gemstone exploration is approximately 0.1 acre per drainage. If the recommended level of 20 machine –dug sites are explored the level of disturbance would be about 0.03 acre per drainage.

Commercial Exploration

Prospecting sites are proposed in the following watersheds: East Fork Emerald Creek, Bechtel Creek, Cat Spur Creek and Hidden Creek.

There are three exploration sites on Bechtel Butte that consist of hand-dug trenches approximately 10 ft. by 12 ft. each. Hand dug exploration pits or trenches are also proposed in Cat Spur. Each trench would be reclaimed before beginning the next prospecting pit. Reclamation for trenches is described in soil and water design criteria in Chapter 2.

Exploration at sites within the other drainages will occur in floodplain or terrace locations. Trenches are dug with an excavator and will vary in size, but are generally 10-15 feet deep, 5 feet wide and about 15 feet long. Location of sites would follow design criteria, and the reclamation for trenches is also described in soil and water design criteria in Chapter 2.

East Fk. Emerald floodplain-terrace location: 0.005 acre (2 sites @ 5 ft. by 20 ft.)

West Fork St. Maries River

Cat Spur Creek: estimated 0.014 acre (5 sites @ 10 ft. by 12 ft.)

Hidden Creek floodplain-terrace location: 0.002 acre (1 site @ 5 ft. by 20 ft.)

Bechtel Creek floodplain-terrace location: 0.005 acre (2 sites @ 5 ft. by 20 ft.)

Bechtel Butte: 0.01 acre (3 sites @ 10 ft. by 12 ft.)

Commercial Gemstone Extraction

Issue a lease for gemstone extraction on Bechtel Butte. Proposed disturbance is 9-15 pits, each with a diameter of 15 feet; a trench 100 ft. by 20 ft. by 8 ft. deep and other smaller trenches.

Bechtel Butte: 0.05 acre (1 site @ 20 ft. by 100 ft.)

Bechtel Butte – ridge location Emerald Creek side: maximum 0.06 acre (15 sites @ 15 foot diameter).

Direct effects from the above exploration activities and commercial gemstone extraction are vegetation removal; soil horizon mixing; removal of garnet sands and gemstones; decreased resistance to erosion from vegetation removal, both at the surface (loss of vegetative cover) and subsurface (loss of root strength); and possible soil compaction from excavator or back hoe. Disturbance levels are displayed above.

Indirect effects from the above exploration activities and commercial gemstone extraction may include surface erosion before vegetation becomes reestablished and weed introduction. For sites on Bechtel Butte possible down slope soil movement may occur, but no delivery to the stream system is expected because of an adequate vegetative buffer. The closest location to a stream channel is about 350 feet for sites on Bechtel Butte. Sediment transport to the stream system from exploration on terraces or floodplains is not likely to occur because of the minor areal disturbance, vegetative buffers and flat terrain, sediment movement is not expected.

Water Quality – Sediment

Sediment basins, straw bale sediment traps and a dam with settling pond are utilized for sediment reduction to the stream system from this recreational operation. Any instream

basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

Water Quality – Other Pollutants

No change in water quality is expected. No change in any chemical concentration is expected from this activity because no introduction of chemicals is anticipated.

Equipment operation for the most part would occur outside stream channels, except perhaps in transit from one site to the next or where a crossing is necessary. Accidental fuel or oil spills are always a possibility, but emergency spill equipment should be available where equipment is operating. A physical parameter like temperature is not expected to change because no significant change in stream shading will occur.

Water Quantity and Timing

No change is expected to water yield or timing because no significant change in vegetative cover would occur from these activities. Significant changes in vegetative cover may influence melt rates (Packer, 1971); and increase water yield if over a 20% reduction (Stednick, 1996).

Beneficial Uses

Pollutants of concern for downstream reaches that are listed as WQL Segments include: nutrients, temperature, sediment, and habitat alteration. No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases are not expected because no significant change in vegetative cover; and though some sediment increase is expected, the use of a suction dredge is proposed to remove any introduced sediment from nearby downstream reaches to remain within the policy of no net increase in pollutants that are inhibiting full attainment of beneficial uses; habitat alteration would not be increased in downstream reaches because introduced sediment would be removed and no increase in water yield is anticipated.

Stream Channel Integrity

Compromise to stream channel integrity is not expected because no net increase in sediment (introduced sediment would be removed by suction dredge) or water yield (no change in cover or melt rates) would occur from these activities.

Potential Development:

If exploration identifies sufficient reserves of garnet sands then development of these mineral resources will occur if extraction and production costs are economically viable. If exploration of the gemstone reserves for recreational digging identifies reasonable quantities then development will occur.

Commercial Garnet Sand Development: A large area may be considered for lease, which includes portions of Emerald Creek, West Fork (St. Maries) and Hidden Creeks.

Approximately 10,000 lineal feet of the East Fork Emerald Creek may be utilized for sand extraction, from the confluence of the East and West Forks Emerald Creek upstream to the confluence with Flat Creek (per map provided by Emerald Garnet Co.) Some of the valley bottom of the East Fork is too narrow for economic viability and that is also the case in the Little East Fork of Emerald Creek, which will not be disturbed for sand extraction (Steve Osburn, Emerald Creek Garnet Co. Pers. Comm.). If this length were utilized over a five-year time frame about 2000 lineal feet, or over ten years 1000 lineal feet would be mined per year. I envision a lineal disturbance level of 2000-6000 feet of streambank per annum. Any level of stream course alteration would be reclaimed within the same year, prior to snowfall.

The level of annual disturbance and effects from the potential sand extraction *can only be estimated at this time*. Once the mining Plan of Operation is developed, site-specific effects and level of disturbance will be assessed.

Direct effects from the above exploration activities and commercial gemstone extraction are vegetation removal; soil horizon mixing; removal of garnet sands and gemstones; decreased resistance to erosion from vegetation removal, both at the surface (loss of vegetative cover) and subsurface (loss of root strength); and possible soil compaction from excavator or back hoe. Disturbance levels are displayed under the Measurement section above.

Indirect effects from the above exploration activities and commercial gemstone extraction may include surface erosion before vegetation becomes reestablished and weed introduction. For sites on Bechtel Butte possible down slope soil movement may occur, but no delivery to the stream system is expected because of an adequate vegetative buffer. The closest location to a stream channel is about 350 feet for sites on Bechtel Butte. Sediment transport to the stream system from exploration on terraces or floodplains is not likely to occur because of the minor areal disturbance, vegetative buffers and flat terrain, sediment movement is not expected.

Water Quality – Sediment

Sediment basins, straw bale sediment traps and a dam with settling pond are utilized for sediment reduction to the stream system from this recreational operation. Any instream basin or pool will store some of the sediment generated, but because they are within the channel turbid water is likely to move beyond these basins and travel downstream. This may be especially true during higher runoff events or when maximum activity is occurring at the gemstone extraction sites. Also of concern is the level of sediment that would be entrained when these types of structures are constructed or cleaned of their additional sediment burden.

Water Quality – Other Pollutants

No change in water quality is expected. No change in any chemical concentration is expected from this activity because no introduction of chemicals is anticipated.

Equipment operation for the most part would occur outside stream channels, except perhaps in transit from one site to the next or where a crossing is necessary. Accidental fuel or oil

spills are always a possibility, but emergency spill equipment should be available where equipment is operating. A physical parameter like temperature is not expected to change because no significant change in stream shading will occur.

Water Quantity and Timing

No change is expected to water yield or timing because no significant change in vegetative cover would occur from these activities. Significant changes in vegetative cover may influence melt rates (Packer); and increase water yield if over a 20% reduction (Stednick).

Beneficial Uses

Pollutants of concern for downstream reaches that are listed as WQL Segments include: nutrients, temperature, sediment, and habitat alteration. No change to existing beneficial uses is expected because water quality is not expected to change due to introduction of chemical pollutants; temperature increases may occur if the stream channel is shifted to the north side of the valley and it loses the shade provided by the mountains to the south. Temperature is not expected to change because of a significant change in vegetative cover; and though some sediment increase is expected, the use of a suction dredge is proposed to remove any introduced sediment from nearby downstream reaches to remain within the policy of no net increase in pollutants that are inhibiting full attainment of beneficial uses; habitat alteration would not be increased in downstream reaches because introduced sediment would be removed and no increase in water yield is anticipated.

Stream Channel Integrity

Alternative B

Because the potential mining of garnet sands under Alternative B would utilize the whole valley bottom, the stream channel will be moved. This activity is expected to increase sediment in downstream reaches because of entrainment of fine material from a new location and from erosion of streambanks. This increased level of sediment is not expected to be long-term. The rehabilitation of the valley and stream channel includes a generous attempt to revegetate the disturbed sites including shrub transplants to steam banks (see photo appendix of rehabilitated sites). No change in water yield (no significant change in cover or melt rates) would occur from these activities.

Alternative C

No streambank alteration will occur in Alternative C.

Commercial garnet sand extraction is not expected to increase sediment in the stream system because of the 30-foot buffer to the stream channel. A suspended sediment sampling analysis found no significant difference in sediment levels above or below the Garnet Mining Company's site in 1992-1994, which included a 30-foot buffer (Hallisey, 1994). The level of annual disturbance and effects from the potential sand extraction can only be estimated at this time. Once the mining Plan of Operation is developed, effects and level of disturbance can be assessed.

Cumulative Effects Summary

Recreational and Commercial Exploration

Commercial Exploration would occur on five sites. With mitigation measures including the 30-foot buffer from stream channels in Alternative C, short duration (a few hours per trench) and small areal extent (approximately 0.01 acres per trench) of the exploration trenches no effects to the soil or water resources are expected. Total ground disturbance is 0.01 acre in the West Fork Emerald and Hidden Creeks and 0.02 acre in the East Fork Emerald Creek and in Bechtel Creek.

Recreational exploration would occur in Wood Creek, No Name, Pee Wee, Strom, 281 and Garnet Gulches. Because these drainages have narrow valleys, exploration pits or trenches would have a ten-foot buffer from stream channels. It is estimated that up to 60 test sites could be implemented in each drainage. This would be a combination of auger holes, hand –dug pits and machine –dug trenches. It is my recommendation that a maximum of twenty machine –dug trenches be allowed per drainage. The proposed exploration disturbance would total 0.003 acres per site or 0.1 acres per drainage for the total of 20 machine –dug trenches. With mitigation measures including the 10-foot buffer from stream channels, short duration (a few hours per trench) and small areal extent (approximately 0.003 acres per site) of the exploration pits no effects to the soil or water resources are expected.

Recreational Gemstone Extraction

Gemstone extraction is currently occurring in the West and East Forks of 281 Gulch. The disturbed area is approximately 0.1 acre (200' x 25') in the West Fork 281 and 0.05 acre (100' x 25') in the East Fork 281. There is an estimated sediment load coming from this operation of 0.1 cubic yards of material with a mean value of 2.1 cubic yards. This amount of estimated sediment will need to be removed from East Fork Emerald Creek to meet the no net increase in sediment to 303(d) listed streams, policy of the Idaho Department of Environmental Quality and IPNF direction. If this and other design criteria are followed no effect to water or soil resources are expected.

Private Activities

Activities on private lands include timber harvest, garnet sand mining, grazing and farming. The activities proposed under the decision of this NEPA document will not have an effect to water quality, quantity or timing, stream channels or Beneficial uses as described above. Removal of sediment that would be introduced to the stream system is the main qualifying reason behind this no effect determination. The Garnet Mining Company is planning 20 acres of garnet sand extraction on private land in the West Fork of Emerald Creek. The State of Idaho and its permitting process control impacts from this activity.

Consistency with Forest Plan and Other Laws and Regulations

IPNF Forest Plan consistency with State Water Quality Standards and stream channel integrity, for recreational and commercial exploration, permit issuance for gemstone extraction and recreational gemstone extraction, will be attained through application of design

criteria and BMPs, including IDL-Bureau of Mines, Chapter 2 (Idaho, 1992). Use of a suction dredge to remove introduced sediment will also keep the activity in compliance.

Riparian Habitat Conservation Area Management Objectives will not be compromised provided all design criteria in Chapter 2 are applied. Channel rehabilitation following relocation or reconstruction may actually achieve, or move conditions toward meeting, the RHCA objectives through incorporation of large woody debris and significant riparian plantings.

Compliance with the Clean Water Act and Idaho Water Quality Law are expected if design criteria are followed, because suction dredging will remove introduced pollutant sediment and no other pollutant increase is expected. Channel rehabilitation following relocation or reconstruction may actually achieve, or move conditions toward meeting, the RHCA objectives through incorporation of large woody debris and significant riparian plantings.

SCENIC QUALITY

Regulatory Framework

Numerous Federal laws require all Federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning and project design, implementation, and monitoring. Some of these laws pertinent to this project are: National Environmental Policy Act of 1969, National Forest Management Act of 1976 and Surface Mining Control and Reclamation Act of 1977.

Scenery management direction for the analysis area is contained in the Idaho Panhandle National Forest Land And Resource Management Plan of 1987 (Forest Plan) and is described in the terms of Visual Quality Objectives or VQO's. VQO's were established during the Forest planning process and were mapped by computer. The mapping was based on the area seen from sensitive travel corridors and other features having a high visual sensitivity level. Visual Quality Objectives were assessed with guidance contained in the Visual Management Handbook, Chapter I of the National Forest Landscape Management Series (USDA Forest Service publication 462, 1974). The system was revised and is now known as the Forest Service Scenery Management System. The revised guidelines are contained in Landscape Aesthetics, a Handbook for Scenery Management (USDA, Forest Service publication 701, 1995).

Visual Quality Objectives

Visual quality objectives (VQOs) were adopted during the Forest Planning process using scenery data obtained from the previously described landscape attractiveness and visibility analyses. Adopted scenic quality objectives are based on the seen areas from visual sensitivity (concern) levels assigned to travel routes and use areas. Forest Plan standards are to evaluate the scenic resource based on sensitivity levels and to meet adopted visual quality objectives. Exceptions may occur in unusual situations; these will be identified through the planning process with the interdisciplinary team.

Geographic Scope

The geographic scope of this analysis is the project area as defined in Chapter 1. However, the analysis area for the scenic resource is much smaller and restricted to only those areas of potential activity identified in Chapter 1 of the EIS. The analysis area for direct and indirect effects include, the East and West Forks of Emerald Creek, 281 Gulch, Garnet Gulch, No Name Creek, PeeWee Creek, Strom Gulch, Wood Creek, Catspur Creek tributary and Bechtel Butte.

Analysis Methods

The scenery inventory for this area has been done in the Forest Plan and in previous projects within this project area, Emerald Creek FEIS (1993) and the Hidden Cedar DEIS (2001). The current visual quality of the area was defined by assessing its landscape character and addressing how the character would change with proposed management activity. This area was evaluated for its visual significance based upon viewing opportunities from important travel routes and sites in the vicinity. Proposed activities were then evaluated as to whether or not they meet Forest Plan standards (VQOs) for visual quality. Since the potential activity areas for this project are so limited, only these areas are evaluated for the scenic resource.

Existing Condition

Landscape character gives a geographic area its visual and cultural image, and consists of a combination of physical, biological, and cultural attributes that make each landscape identifiable, or unique. It includes a description of landform, water characteristics, vegetation patterns, and cultural elements appearing on the landscape.

The Garnet Stars and Sands Project Area includes Emerald, Wood, Hidden and Catspur drainages which drain into the West Fork of the St. Maries River. The landscape character of the project area is forested landscapes that have been heavily modified by timber harvest, mining and road construction activities. The entire area has been shaped by human activities and cultural influences. The area has been developed for timber production, agriculture, mining, grazing, and residential/urban uses. Numerous residential house/farms are scattered along and up the side drainages and the community of Clarkia is within the landscape area.

The combination of landforms, waterforms, vegetation, and cultural elements have resulted in a consistent landscape character over the geographic area. The landscape of the project area falls into *one landscape character class:*

- Highly modified mature/immature mixed conifer forested landscapes on mountain slope or stream breakland landforms.

Variety Classes

Variety classifications are: Class A- Distinctive; Class B- Common, and Class C-Indistinctive.

The entire project area falls into Class B – Common which is defined as: Areas where landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes have generally positive, yet common

attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern and balance.

Landscape Visibility

Landscape visibility is defined by two elements : human values as they relate to the relative importance to the public of various themes and the relative sensitivity of scenes based on the position of the observer. The human value component is usually described by concern levels. The observer position component is described by utilizing varying distance zones.

Concern Levels

The main travel routes which traverse the area and from which the area is viewed are: Sensitivity Level 1 (High); State Hwy 6 along the St. Maries River and the Emerald Creek Campground; Sensitivity Level 2 (Medium); Road 504 (Bechtel Creek to Bechtel Butte), Road 447 (Emerald Creek), and the Emerald Creek Garnet Area; Sensitivity Level 3 (Low); the remainder of travel routes in the project area.

Levels 1-3 indicate the degree of scenery importance for specific viewing locations such as communities, recreation areas, roads, and trails.

Visual Quality Objectives

Visual Quality Objectives (VQO's) were adopted during the Forest Planning process using the scenery data obtained from the previously described landscape attractiveness and visibility analyses. Adopted VQO's for the Idaho National Forest (IPNF) are contained in maps generated during the Forest planning process and are available at the St. Joe R.D office in St. Maries.

Visual Quality Objectives consist of five levels that describe scenery management objectives ranging from low scenic integrity to very high scenic integrity. The five levels are: Preservation, Retention, Partial Retention, Modification and Maximum Modification. The levels are directly correlated to VQO's contained in the IPNF Forest Plan. The two VQOs that are within the potential activity areas are Partial Retention and Modification.

Partial Retention (Moderate Concern): Management activities remain visually subordinate to the characteristic landscape. Activities may also introduce form, line, color or texture which are found infrequently or not at all in the characteristic landscape but they should remain subordinate to the visual strength of the characteristic landscape. The East Fork of Emerald Creek is the area of potential activity within this VQO.

Modification (Low Concern): Activities may visually dominate the original characteristic landscape. However, these activities must borrow from naturally established form, line, color, or texture. The remaining activity areas are within this VQO.

Environmental Consequences

Analysis Methods

Land management activities can affect the scenic resource and landscape character because of contrasts created between natural or natural appearing forested landscapes and those unacceptable modified by management activities. These contrasts consist of changes in line, form color and texture of the vegetation and soil. The effects these alterations have are somewhat dependent upon individual values. The sensitivity routes in the area are all considered to be sensitivity level 2 which produces a VQO of "Partial Retention"or Scenic Integrity level of "Moderate" in the foreground and "Modification" (Low) in the middleground and background. The potential development areas are described under Geographic Scope.

To complete the scenery effects analysis, two primary references noted under Regulatory Framework were used, Landscape Aesthetics, A Handbook for Scenery Management, USDA Handbook No. 701 and The Visual Management System, USDA Handbook No. 462. The following citations are taken from Handbook No. 701. These provide guidelines with which to analyze potential mining activities. Scenery analysis should consider "Visual sensitivity of the landscapes, based on the context of the landscape being viewed, perceptual factors of people viewing those landscapes and different visual characteristics of a landscape." (pg 19, 1995) "People have the ability to perceive landscape character and develop expected images." (pg 28) "Types of viewers are important......Types of viewers will vary by geographic region, as well as by travel route or use area such as a developed recreation site........ Viewer expectations will vary according to the landscape setting and available recreation opportunities." (pg 33)

Direct, Indirect and Cumulative Effects

Alternative A

Alternative A is the No Action alternative. There would be no direct or indirect effects from implementing this alternative. The mining permits and applications would be denied and the recreational mining would be discontinued after 281 Gulch was depleted. There would also be no cumulative effects within the more limited scenery effects area for this project. In the larger project area, there would continue to be effects from private land management activities, e.g. timber harvesting, rural development and mining and potentially effects from the upcoming Hidden Cedar Project (DEIS, 2001), a landscape management project on National Forest lands. The scenery analysis for Hidden Cedar demonstrates compliance with project VQOs.

Alternatives B and C

The activity areas for both action alternatives are primarily limited to small areas within several drainages. For the scenic resource, these two alternatives are considered to have the same effects.

This effects analysis is organized as in Chapter 1 with Recreational Garnet Digging first.

281 Gulch, Garnet Gulch, No Name, PeeWee, Strom and Wood Creeks would be tested with a combination of auger holes, hand-dug pits and /or machine –dug trenches. These holes would be refilled immediately. These areas would not be viewed from main travel routes, the Emerald Creek Campground nor by the Emerald Creek Garnet area visitors. These areas are within the "Modification" VQO. There would be no effects to the scenery resource and activities are well within the Forest Plan VQO.

Maintaining a recreational garnet digging area: this entails developing one of the drainages for the next garnet digging area after 281 Gulch is depleted. Chapter 2 includes developing only one drainage at a time. None of the potential garnet areas that are being considered for development can be viewed from the Emerald Creek Campground or the two travel routes identified in the Forest Plan. Therefore, as noted above, expectations of people using the area determine the level of concern. "Viewer expectations will vary according to the landscape setting and available recreation opportunities." (pg 33 of USDA Handbook No. 701) People's expectations become paramount to this analysis.

The visitors are engaged in having fun while digging for garnet gemstones. (Please see the Recreation Section for a description of the experience people have at the area.) They ARE expecting to see an open riparian area with mud, sediment ponds, people digging and washing gravel, in order words "an unnatural landscape" in the immediate digging area. These digging areas are within the foreground of the Emerald Creek Garnet area. This places these areas within the "Partial Retention" VQO. However, the Garnet Area itself promotes an experience that is within an "unnatural" landscape. The previous year's dig sites are rehabilitated every year in the fall. By the time, visitors arrive in the spring there is vegetation growing back on last year's sites. For 20-30 years, there will be a lack of large trees within the immediate riparian area. However, due to garnet area visitor's expectations, scenic integrity is being maintained.

There is a lease application for gemstones on Bechtel Butte. It entails 5-6 pits and a trench. This area can only be viewed from afar and is the background for identified travel routes. There would be no direct or indirect effects to the scenic resource.

There are prospecting permit applications that cover several areas. One is within a small tributary of Catspur Creek. It entails hand -prospecting trenches. This activity area cannot be viewed from the identified travel routes. There would be no direct or indirect effects to the scenic resource. Another permit is for garnet sand prospecting on Bechtel Butte. It entails 3 hand- dug trenches. These trenches could not be viewed from the identified travel routes. There would be no direct or indirect effects to the scenic resource.

The remaining prospecting permits are for garnet sands within the East Fork and West Forks of Emerald Creek. The prospecting permits themselves only entail digging and testing trenches that would immediately be refilled. There would be no effects to the scenic resources from this activity.

However, this EIS is also considering possible subsequent development that could occur if a lease application for commercial mining is applied for. The West Fork activity would not be viewed from identified travel routes or the Recreation Areas. The East Fork activity area entails approximately 10,000 lineal feet of stream with garnet sand mining on both sides. This would not be contiguous 10,000 feet; the mining would be in segments over 3-4 miles of

stream and would occur over 10 years. These areas are in "Partial Retention", the middleground of Emerald Creek Campground and foreground of Forest Road 447, an identified Level 2 route of the Forest Plan. Garnet area visitors currently travel this road to get to the Emerald Creek Garnet Area.

Only a small portion of the 10,000 feet currently have riparian area trees; this is due to past mining and railroad logging. The remaining riparian areas are open with grasses and brush. With the activity taking place over ten years time, one can assume 1000 feet per year would be in a "disturbed" state. Visual effects from this activity would be clearing of vegetation, disturbed soil, mounds of topsoil placed for rehabilitation and settling ponds. Equipment, activity and people would be visible in the area.

Rehabilitation of a stream in the West Fork of Emerald Creek was reviewed by the visuals specialist (summer 2000). Implementation of this rehabilitation was done by the same company applying for these permits. This site is very similar to conditions along the East Fork of Emerald Creek and the same mining methods were used. After mining, the stream channel was re-established, large woody debris and stream structures were incorporated and the area was revegetated. From a scenic resource point of view, the results were very acceptable. The landscape character and scenic integrity was re-established.

There would be slightly less effects from potential activities of Alternative C than from B. Alternative C does not include mining within the stream channel and has a required 30 foot buffer. It is likely for either action alternative that the potential mining itself would not meet the VQO of Partial Retention; however, the rehabilitation, except for large riparian trees, can be complete within 2-5 years. This would be considered a temporary visual effect and could possibly be considered an "exception for unusual situations" as identified in the Forest Plan. If and when an Operating Plan is filed, there would be an additional NEPA decision required. At this time, these are only estimates because without an operating plan, there is no certainty of the proximity of potential mining.

There is a lease renewal within the East Fork of Emerald Creek. These effects would be the same as that noted under potential mining in #4 above.

Compliance with Forest Plan Standards and Laws

Alternative A is within Forest Plan Standards. Immediate activities proposed for Alternatives B and C are within Forest Plan Standards for scenic resources. The potential development scenarios for the commercial sand mining in the East Fork of Emerald Creek may be "an exception" for unusual situations. However, this is also within Forest Plan Standards. The effects can only be estimated until a Lease Application and Operating Plan are submitted.

THREATENED, ENDANGERED AND SENSITIVE PLANTS

Introduction

Ground disturbing activities have the potential to impact Endangered, Threatened, Proposed, and Sensitive (TES) plants. Effects on population viability from disturbance events (natural or human-caused) are hard to quantify with certainty for all TES plant species and species of concern. Specific knowledge of population biology and species ecology is not yet known for several species, particularly the sensitive moonworts and certain orchids. Much of the current knowledge regarding TES plant species is based on observational and even anecdotal information. Recent literature and monitoring reports for several species, including deerfern (Blake and Ebrahimi, 1992), Henderson's sedge and Constance's bittercress (Lichthardt, 2000), and Idaho barren strawberry (Crawford, 1980) provide a greater understanding of the relationship of habitat disturbance to the integrity of species populations.

The risk of adverse effects on TES plants from activities varies with treatment type, timing of treatment, extent of treatment, habitat suitability, and the species at risk. Plant surveys and mitigation measures are designed to protect populations and suitable habitat. Activities with effects that could lead to loss of population viability or trend toward federal listing would have the highest risks associated with them. Other activities may impact individual plants but are not likely to adversely affect population viability and as such are low to moderate risk activities. Small changes in the light regime, moisture levels, or moderate soil disturbance can impact individuals or populations of species dependent on specific successional habitats, soil fungi (mycorrhizae) associations, or canopy closure. Observations and monitoring information indicate that some activities may have little, or even positive, effect on some species, such as deerfern (Blake and Ebrahimi, 1992) and Constance's bittercress (Crawford, 1980).

The purpose of this analysis is to determine if alternatives will adversely impact TES plants that may occur in the Garnet Stars and Sands project area, to insure that the alternatives do not contribute to loss of rare plant population viability, and to insure compliance with Forest Service and other federal policies. Indicators used to measure effects on sensitive plants and suitable habitat include: the extent of ground disturbance, proximity of proposed activities to known occurrences and suitable habitat

Regulatory Framework

Protection of plant species deemed threatened, endangered, or rare (Forest Service "sensitive") and protection for population viability is determined by Federal legislation, regulations, policy, and direction. This regulatory framework includes the National Environmental Policy Act (1969); the Endangered Species Act (1973), as amended; the National Forest Management Act (1976); Forest Service manual 2672.1 - 2672.43 (USDA, 1990); Idaho Panhandle National Forests, Forest Plan (USDA, 1987); and direction from the Washington Office and Regional Watershed, Wildlife, Fisheries, and Rare Plant program.

Analysis Area

The geographic scope of analysis for rare plant species in this project is the Garnet Stars and Sands Project Area (approximately 20,300 acres of Forest Service ownership, and 31,800 total acres). Geographic scope of potential effects (direct, indirect, and cumulative) is determined by a combination of factors including: activity areas, geographic location, the scope of the proposed action, resources and species which may be present, consequences and scope of effects, and the ability to measure effects. The scope of action and potential for adverse effects determine the extent of analysis necessary. This analysis considers short and long term management as it may affect known or suspected populations of TES plant species as well as their potential habitat.

Analysis Methods

Plant species can be assigned to one or more rare plant guilds, which are artificial groups based on similar habitat requirements and useful for the purpose of analysis (Mousseaux, 1995). For the District the rare plant guilds are: aquatic, deciduous riparian, peatlands, wet forest, moist forest, dry forest, and subalpine. Rock seeps and springs are another habitat that can support certain TES species, but they can occur across all guilds and are not identifiable at a coarse scale. A complete description of all guilds is located in the project file.

Based on current information regarding preferred habitat and successional state for species within the different guilds, the District Timber Stand Database indicates the amount of highly suitable rare plant habitat that may be present in the project area. In addition, site specific information from timber stand examination records, aerial photographs, topographic position, existing habitat and survey information, personal knowledge and professional judgment were used in analysis. Evaluation of known sites for TES and species of concern (SOC) plants was accomplished using District Sensitive Plant Records and Idaho Department of Fish and Game Conservation Data Center (ICDC) Element Occurrence Records.

Existing Condition

The subbasins of northern Idaho contain varied and diverse habitats and plant communities. Of the estimated 1,200 to 1,500 plant species known or thought to occur here, about ten percent are considered rare or uncommon.

There are no known sites of federally listed plants on the Forest. The USDI Fish and Wildlife Service indicates that two species listed as threatened might possibly occur on the District (USDI, 2001, add new one). A threatened species is any that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Water howellia (*Howellia aquatilis*) and Ute ladies'-tresses (*Spiranthes diluvialis*) could potentially occur on the district. Suitable habitat is suspected, but to date, there are no documented citations of these species on the Idaho Panhandle National Forest.

Spalding's catchfly (*Silene spaldingii*) was proposed as threatened in December 1999 (USDI, 2001). Suitable habitat is suspected, but to date, there are no documented citations of this species on the Idaho Panhandle National Forest.

Sensitive species, as determined by the Regional Forester (USDA, 2000), are those for which population viability is a concern. This can be indicated by a current or predicted downward trend in population numbers or suitable habitat, which would reduce the species' existing distribution. Twenty-five of these species are known or thought to occur on the St. Joe Ranger District. One occurrence each of deer fern (*Blechnum spicant*) and least moonwort (*Botrychium simplex*) are known within the project area (ICDC, 2000). Outside of the project area, but within two miles of the project boundary, there are two populations of deerfern, and one population each of Henderson's sedge (*Carex hendersonii*) and western goblin (*Botrychium montanum*) (ICDC, 2000).

Along with threatened, endangered, and sensitive plants, the Forest also tracks 23 Forest species of concern. These species are considered to be secure at the global, Regional, and state levels, but may be at risk at the Forest planning level. While biological evaluations are not required to address species of concern, they are addressed in effects analysis (per the National Forest Management Act) when viability within the planning unit is an issue. There is one known site each of Lieberg's tauschia (*Tauschia tenuissima*) and phantom orchid (*Eburophyton austiniae*) on private and federal land respectively within the project area. Outside of the project area, but within two miles of the project boundary, there is one population of Lieberg's tauschia (ICDC, 2000).

Results from habitat queries of the timber stand database indicate an approximate total of 23,100 acres (387 wet forest, 1230 acres of dry forest, and 21,475 acres of moist forest guilds) of high potential rare plant habitat within the project area (see High Potential Habitat Stands in Garnet Stars and Sands Project Area in the project file). Actual acres impacted by project activities will be much smaller. Table 3-16 displays the length of tributaries along which testing and recreational digging may occur in the future. The approximate area of high potential rare plant habitat that would be disturbed due to these activities is also shown. Recreational digging was assumed to disturb up to 100 feet on either side of the tributary. Acres within Pee Wee, No Name and some of 281 Gulch have already been disturbed.

Table 3-16 - Rare plant habitat that may be disturbed through digging or testing.

Stream	length (miles)	approximate acres of rare plant habitat affected		
		moist	wet	Silene
Wood Creek	1.5	35	3	3
281 Gulch	1	19	6	-
Garnet Gulch	1	13	13	-
Strom Gulch	1	26	-	-
Pee Wee Creek	1	26	-	-
No Name Creek	1	26	-	-

The lease application on Bechtel Butte (Ellison) covers an area of approximately 80 acres. Of the 80 acres, 60 are located in high potential moist forest habitat. However, the actual amount of ground to be disturbed through prospecting will be less than 2 acres. A pending prospecting permit application on Bechtel Butte (Robert) would result in three 10 ft x 12 ft hand-dug trenches in high potential moist forest habitat. The prospecting permit on Catspur Creek may allow activity in up to ½ mile of potential *S. spaldingii* habitat. However, trenches will be dug within the riparian zone and this is not *S. spaldingii* habitat. Mining for garnet

sands along a tributary of the West Fork of Emerald Creek would occur along approximately .5 miles of stream. About 25 acres of ground would be disturbed, much of it adjacent to high potential moist forest habitat and potentially in deciduous riparian habitat. Test sites for prospecting permits would be permitted in several locations within the project area. Two sites are located along the East Fork of Emerald Creek in T 42N R 1E Sections 3 and 4. Both of these sites occur in potential *Silene spaldingii* habitat and were surveyed in the summer of 2001. No *S. spaldingii* were found. The remainder of the test sites occur in T 42N R 1E Sections 13 and 27 in *S. spaldingii* and moist forest habitats, and in T 42N R 1W Sections 14 and 13 in moist forest habitat.

High potential dry forest, subalpine, aquatic, and peatland habitats do not occur within proposed activity areas. Deciduous riparian habitat may exist within activity areas. Ground-truthing will be required to ascertain its existence. A list of wet and moist forest species and their habitats and a complete list of sensitive species and species of concern are included in the project file.

Of the nearly 31,800 acres within the project area, approximately 23,100 acres on Forest Service lands are known to be rare plant high potential habitat. Since close to 35% of the project area is not under Forest Service ownership, the amount of high potential habitat is likely higher. Past and ongoing activities within the project area have led to habitat modification and fragmentation. Grazing has been occurring within the area for many decades. Road construction, mining, timber sales, recreational use, vehicular traffic, grazing, and natural events have all contributed to an encroachment of weeds into the area, primarily along roads, in open meadows and in disturbed areas.

Environmental Consequences

Plant Surveys

Regional direction (Leonard, 1992) states that the need for and extent of field reconnaissance should be commensurate with the risk associated with the project and species involved, and the level of knowledge already in hand. Field surveys will be conducted in all areas slated for project activities that contain high potential suitable habitat. Surveyors will walk through activity areas with the potential to contain TES plants during the growing season of those species likely to be found there. A general survey will be conducted, with more time being spent in special habitats. If any rare plant individuals are found, intensive searches will be conducted within the area. Species presence is assumed for all highly suitable habitats and field surveys either validate or negate presence. Any occurrences that are deemed necessary to ensure species and population viability against a potential trend towards federal listing, are protected. These practices are assumed to be an effective conservation strategy. Some isolated individuals or occurrences, not deemed critical to population viability, may be impacted by activities. Occurrences discovered prior to project implementation would have mitigation measures designed by the District Botanist to ensure that species and population viability are maintained.

Some field surveys for *Silene spaldingii* were conducted in areas of potential habitat On July 18 and August 13 and 15, 2001. Additional acres of potential *S. spaldingii* habitat remain to be surveyed.

Field surveys for this project will be located within the project file.

Direct, Indirect, And Cumulative Effects

Alternative A

There are no known direct or indirect effects of the no-action alternative. Surveys conducted prior to the opening of 281 Gulch to digging did not reveal the presence of any rare plants. Cumulatively, the effects resulting from all activities within the project area may have a negative effect on rare plants or their habitats. However, the effects resulting from recreational garnet digging in 281 Gulch are not expected to contribute to such negative effects.

Alternative A would have **no effect** on *Spiranthes diluvialis*, *Howellia aquatilis*, or *Silene spaldingii*. Potential habitat does not exist within 281 Gulch and no other areas would be impacted under this alternative.

Wet and Moist Forest high potential habitat exist along 281 Gulch. This area was surveyed prior to the initiation of recreational digging in the area and no rare plants were found. No other rare plant guilds are located within the area affected by activities and so this alternative will have **no impact** on rare plant guilds.

Direct and Indirect Effects

Alternatives B and C

Alternatives B and C differ only in the amount of potential rare plant habitat that would be disturbed. Alternative C essentially precludes recreational digging and reduces the amount of land disturbed during commercial garnet sand mining. High potential habitat exists in every area that is slated for garnet extraction activity. All areas scheduled for ground disturbing activities that have a possibility for adverse effects within high potential habitat will be surveyed for TES species prior to project implementation.

Surveys for *Silene spaldingii* have been conducted in potential habitat along Catspur Creek, the West Fork of the St. Maries River, and portions of the East Fork of Emerald Creek. *S. spaldingii* was not found and in most instances, neither was suitable habitat. The probability of garnet gem and sand extraction adversely affecting *S. spaldingii* is not likely because the plant does not prefer riparian habitats.

The known populations of deerfern and least moonwort are not located in an area of proposed garnet activity. There are two known populations of species of concern in the project boundary. One is a population of Lieberg's tauchia on private land. The second is a population of phantom orchid located along the East Fork of Emerald Creek, which lies within the area proposed for garnet sand mining. Efforts will be made to relocate the population and ascertain the level of threat garnet sand mining would pose. Mitigation measures would be prescribed if necessary

In the event that any TES plant populations are found prior to project implementation, the District Botanist will implement any necessary mitigation measures. As described in the

design features of Chapter 2, population viability would be protected, although some isolated individuals may be impacted by activities.

Cumulative Effects

The cumulative effects area for TES plants and highly suitable habitat was determined to be the project area. Past activities on federal and other lands, including fire, road construction, and timber harvest have likely affected populations and habitat of rare plants. Design criteria would be applied to protect TES plant species and viability for any populations discovered prior to project implementation. The loss of individual plants would not contribute to the loss of population viability. State and private lands are not required to protect sensitive species or species of concern. Current and future activities such as road building, timber harvest, burning, and recreation can be expected to result in habitat modification or plant population loss on these lands.

The cumulative effects to TES plants would be very similar in Alternatives B and C. While some aspects of Alternative C pose lower risks to TES species, the overall risks are not expected to be appreciably lower than in Alternative B due to design features, planned mitigation, and proposed surveys.

Alternatives B and C would have no effect on *Spiranthes diluvialis* or *Howellia aquatilis* because habitat does not exist within activity areas. Potential habitat does exist for *Silene spaldingii* within the project area. Areas of potential habitat would be thoroughly surveyed prior to any project initiation. Until such surveys are completed these alternatives are not likely to jeopardize the continued existence of the species or result in destruction or adverse modification of proposed critical habitat.

For the moist and wet forest guilds these alternatives May impact individuals or habitat but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Forest Plan Consistency

The Forest Plan states one management goal as "manage habitat to maintain populations of identified sensitive species of animals and plants" (Forest Plan, II-1). A Forest Plan standard for sensitive species is to "manage the habitat of species listed on the Regional Sensitive Species List to prevent further declines in populations which could lead to Federal listing under the Endangered Species Act" (Forest Plan, II-28). The Forest Plan also identifies the need to "Determine the status and distribution of Threatened, Endangered, and Rare (sensitive) plants on the IPNF" (Forest Plan, II-18). All of the proposed alternatives, with requirements for surveys and implementation of mitigation measures, would meet the intent of the Forest Plan. The No Action Alternative would also meet the intent of the Forest Plan.

All alternatives would also meet the intent of the Endangered Species Act and the National Forest Management Act.

WILDLIFE

Introduction

This section displays and discusses the existing condition of wildlife habitat and relevant wildlife species in the project area; and then displays the potential direct, indirect and cumulative impacts to wildlife that could result from implementation of the proposed action(s) or alternatives.

Regulatory Framework

The regulatory framework providing direction for the protection and management of wildlife habitat comes from the following principal sources:

- The Endangered Species Act of 1973 as amended (ESA),
- The National Forest Management Act of 1976 (NFMA), and
- The Forest Plan for the Idaho Panhandle National Forests - 1987 (FP).

Section 7 of the ESA directs federal agencies to ensure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat.

NFMA provides for balanced consideration of all resources. It requires the Forest Service to plan for diversity of plant and animal communities. Under its regulations, the Forest Service is to maintain viable populations of existing and desired species, and to maintain and improve habitat of management indicator species.

The Forest Plan, in compliance with NFMA, establishes Forest wide management direction, goals, objectives, standards and guidelines for the management and protection of wildlife habitat and species, including: old growth habitat, management indicator species, sensitive species, and threatened and endangered species.

Other laws and orders provide additional direction and influence the analysis of potential impacts on wildlife (e.g. NEPA).

Direction concerning implementation of the laws and regulations can be found in Forest Service Manuals (FSM) and various letters/memos from the Forest Service's Washington Office, Regional Office, and the IPNF Supervisor's Office.

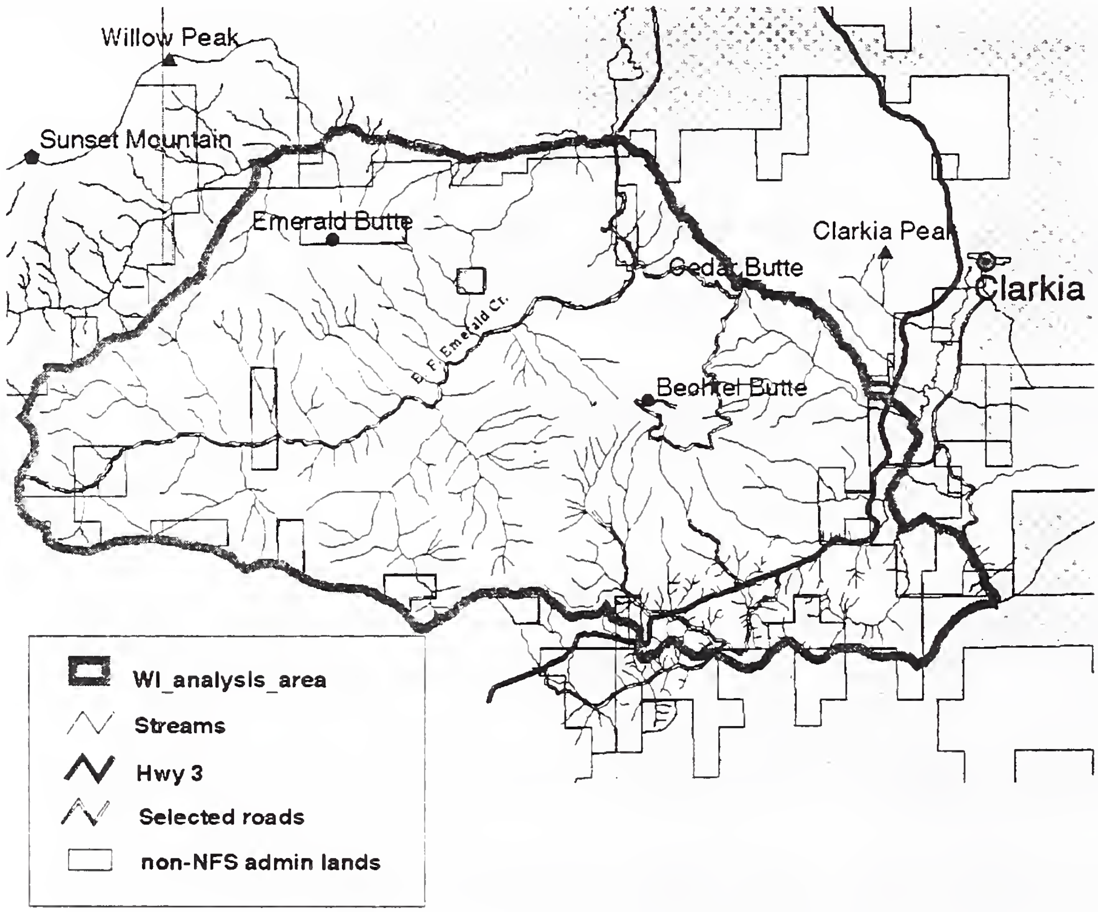
Geographic Scope

The Stars and Sands project area was defined early in the planning process and was delineated based on watershed boundaries, timber compartment boundaries and the area

with underlying garnet bearing geology. The geographic scope of potential effects on wildlife for this analysis was determined based on the spatial distribution of proposed federal actions, all connected actions, potential developments, and the home range of species that may be impacted. The Stars and Sands wildlife analysis area (Figure 3-1) is approximately 20,150 acres with 17,619 acres (87%) under Forest Service administration.

For some species, habitat adjacent to the wildlife analysis area has been considered in the analysis. Also, for some species, due to the nature of species occurrence, distribution of capable/suitable habitat, the scope of the alternatives and lack of impacts throughout the wildlife analysis area, the geographic scope of the analysis has been restricted to the area(s) of potential impact. A more specific description of the geographic scope of the analysis is found under each habitat or species/guild section of this document. Unless stated otherwise the analysis area for habitat/species is the Stars and Sands wildlife analysis area.

Figure 3-1 - Wildlife Analysis Area



Species Relevancy Screen

The National Environmental Policy Act directs the agency to focus on a full and fair discussion of significant issues, and identify and eliminate from detailed study the issues that

are not significant. Wildlife habitat and/or species require varying degrees of analysis to determine potential effects. Some may require relatively detailed analysis with quantitative and qualitative display of information and others may need a less involved analysis.

Threatened, endangered and sensitive (TEandS) wildlife species, Management Indicator Species (MIS) for the St. Joe and additional species of interest that are known or suspected to occur on the IPNF were screened for their relevancy to the St. Joe River drainage and Stars and Sands project. Sighting records, planning documents and other sources (e.g. scientific literature) were reviewed in assessing relevancy. Sources include but are not limited to the Hidden Cedar EAWS and EIS; and the Emerald Creek EIS

A coarse filter screen was applied at the St. Joe River drainage level and then a finer filter screen was used to assess species relevancy at the Analysis Area level. Information/data used in this screening process is also used to assess the level and intensity of analysis needed to address the concern for potential impacts from the proposed action(s).

The assessments of the potential for effects made in this screen consider the scope and nature of the activities associated with the proposed action and alternatives, the potential risks for adverse impacts and the ability to determine potential effects based on available information at the time of this phase of the analysis. If the potential for effects cannot be determined with a reasonable degree of confidence in the screening process then additional analysis will be conducted and documented in the EIS.

Some species or habitats do not occur in the wildlife analysis area and no further analysis is necessary. Other wildlife species or habitats may occur in the wildlife analysis area, but may not be impacted; may be impacted at a level that does not influence use, occurrence, or the decision to be made; or can be adequately addressed through design of the project.

No further discussion and analysis is necessary for species or habitat determined not present within the affected area. Supporting rationale is presented in this document for those species that are determined present in the Analysis Area but not affected due to the nature/scope of the project or project design. Species considered present and potentially affected by the proposed actions will be carried forward in the Environmental Consequences section of the EIS.

Table 3-17 displays the results of the relevancy screening process and provides an explanation of the rationale. Additional information on species not requiring further analysis and the rationale is discussed following the table or can be found in the project file.

Table 3-17 - Screening Process and Results for the Stars and Sands Project

Species/Habitat	Species/Habitat Present in St. Joe drainage?*	Potential for Measurable Effects in Analysis Area?	Need for Detailed Further Analysis?	Rationale for no further analysis**
Endangered				
Gray wolf***	Y	Y	Y	
Woodland caribou	N	N	N	1
Threatened				
Bald eagle	Y	U	Y	
Grizzly bear	N/I	N	N	1
Canada Lynx	Y	N	N	1
Sensitive				
Black-backed woodpecker	Y	Y	Y	
Boreal Toad	Y	Y	Y	
Coeur d'Alene salamander	Y	Y	Y	
Common loon	N/I	N	N	1
Fisher	Y	Y	Y	
Flammulated owl	Y	U	Y	
Harlequin duck	Y	N	N	1
Northern bog lemming	N	N	N	1
Northern goshawk	Y	Y	Y	
Northern leopard frog	U	U	Y	
Peregrine Falcon	I	N	N	1and2
Townsend's big-eared bat	Y	N	N	1and2
White-headed woodpecker	N/I	N	N	1
Wolverine	Y	U	Y	
Management Indicator				
Elk	Y	U	Y	
Moose	Y	Y	Y	
Marten	Y	Y	Y	
Pileated woodpecker	Y	Y	Y	
Other				
Forest land birds	Y	Y/U	N	3
Cavity/Snag habitat	Y	Y	Y	

*Yes, No, Unknown, or Incidental (if at all).

**1 Rationale and documentation is provided in the project file for the determination that the species or habitat is not present within the St. Joe River drainage and/or wildlife analysis area.

2 Species or habitat may be present, but due to the scope of the proposed actions - including design criteria - there would not be any affect on habitat or the species (e.g. harvest of trees would not impact habitat for species associated with lakes). Rationale is provided in the project file and/or later in this document.

3 Species does not apply or is not appropriate for the Project. Rationale is provided in the project file and/or later in this document.

***South of Interstate 90, gray wolves are classified as nonessential experimental populations; this classification treats wolves as proposed for listing under the ESA.

Rationale for no Further Analysis

The St. Joe drainage and/or the analysis area does not provide sufficient capable or suitable habitat for the woodland caribou, grizzly bear, Canada lynx, common loon, harlequin duck, northern bog lemming, or white-headed woodpecker. These species do not occur in the area and there would be no effect on them or their habitat. Additional discussion regarding these species and their habitat/occurrence is documented in the project file.

It can be determined at this time that there would be no effect or there is no benefit/need of further analysis for the peregrine falcon, Townsend's big-eared bat, and Forest land birds. The rational for this conclusion is documented below and in the project file.

<u>Peregrine Falcons</u> are seasonal migrants to northern Idaho, nesting in the northern temperate regions while wintering in the US and southward. They nest on cliffs that are typically higher than 100 feet, with overhanging ledges or potholes and a vertical surface that provide protection from predation. Foraging areas associated with nest sites can include wooded areas, marshes, grasslands and open water.

Species/habitat presence and Rationale for No Further Analysis: There are no known historic eyries or capable/suitable nesting habitat in the wildlife analysis area. The species is not known or suspected to occur in the area. Existing habitat capability and suitability; and the nature and scope of the project preclude the potential for effects on habitat or the species. No further analysis and discussion is warranted.

<u>Townsend's Big-eared Bat:</u> Caves and cave-like structures are a critical habitat for this species, both as hibernacula in the winter and as roosts for summer nursery colonies. They occasionally use bridges and old buildings for roosting and in some places have been known to use building attics as nursery sites (Perkins, 1992 p. 9). In northern Idaho, Townsend's big-eared bats primarily roost in abandoned mines. Loss and disturbance of hibernacula and roosting habitat is the limiting factor for Townsend's big-eared bats.

Species/habitat presence and Rationale for No Further Analysis: There are no abandoned mines or caves in the wildlife analysis area that may serve as potential habitat. The species is not known or suspected in the project area. Based on the lack of suitable habitat and occurrence there would be no impact on habitat or the species.

<u>Forest Land Birds</u> include all the avian species sometimes collectively termed as 'Neotropical migrant birds' and 'resident songbirds'. This group of birds is an extremely diverse group of species, with divergent habitat associations and potential effects.

Species/habitat presence and Rationale for No Further Analysis: Various land birds are known to be present in the wildlife analysis area. Virtually any activity, including no action, may adversely and beneficially affect some species in this group.

Effects on this broad group of species would vary by species/guild and their habitat relationships. Some species would see an increase in capable and suitable habitat by the creation of open conditions. Other species would lose suitable habitat by a reduction in the amount of forested riparian habitat.

Species likely to be affected by activities are represented by other habitat elements and species addressed in this screen and/or analyzed further. Elements and species analyzed include: forest structure, old growth, riparian habitat, general forest species (elk), dry site species (flammulated owl), old growth species (flammulated owl, fisher, pileated woodpecker and northern goshawk), and snag dependent species (pileated and black-backed woodpeckers). Priority Avian Habitats from the Idaho Partners in Flight *Idaho Bird Conservation Plan* (Idaho Partners in Flight, 2000) are included in the analysis.

Forest land birds are being addressed at a state and regional level, which is the level most appropriate. No further analysis specifically for this group of species will be conducted.

Analysis Methods

The appropriate methodology and level of analysis needed to determine potential effects is influenced by a number of variables, including: the potential for impacts, the risk to resources and species, available information, the ability to measure effects, and the information necessary for an informed decision. This analysis starts at a coarse/medium level and proceeds to a finer level of analysis if needed to determine potential effects.

The following documents provide direction used to develop the analysis for potential effects on wildlife.

- Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin (ICB Assessment)
- Integration of Forest Planning into Ecosystem Management: Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area (St. Joe Geographic Assessment)
- Available Conservation Assessments and Strategies (final and draft) for wildlife species
- Additional scientific literature as appropriate.

The analysis also incorporates the concepts in documents such as the *IPNF Standardized Effects Analysis Method for some Sensitive and Management Indicator Species* to help develop and conduct the analysis. The analysis is done at different levels of intensity (i.e. coarse filter - medium filter - fine filter) as appropriate to address the issues and concerns.

This remainder of the analysis is organized as follows:

- Issue Indicators
- Terrestrial Habitat - includes forest structure, old growth, riparian habitat, access/disturbance, connectivity, and cavity habitat
- Management Indicator Species (MIS)
- Threatened and Endangered Species
- Sensitive Species

The analysis evaluates habitat in terms of human disturbance and the capability and suitability of vegetation (e.g. structure and composition) for wildlife species or groups of species with similar habitat needs. For the purposes of this analysis, capable habitat is wildlife habitat that has the fixed attributes that enable it to produce habitat requirements for a given species currently or in the future. These fixed attributes include soils (or parent material, or landtype), slope, aspect, elevation, and habitat type. Suitable habitat is wildlife habitat that currently has both the fixed and the variable stand attributes that enable it to produce habitat requirements for a given species. Variable attributes change over time and may include seral stage, cover type, stand density, tree size, stand age, or stand condition.

Queries of the timber stand data base (TSMRS) and information from field reviews/surveys were used to identify types of habitat and capable and suitable habitat for wildlife species. The changes in habitat conditions and habitat for species will be disclosed and a discussion of the effects will be displayed. Detailed data is available only for National Forest System (NFS) administered lands within the wildlife analysis area. The ownership pattern (i.e. relatively large and relatively contiguous block of NFS land surrounded by other ownerships) allows for adequate analysis of direct, indirect and cumulative effects for most species with the data from NFS lands only. Where information on non-NFS land is crucial to the analysis of effects (primarily for cumulative effects), data was developed via a combination of visual evaluation, photo interpretation, and extrapolation from data on NFS land.

When needed, potential cumulative effects on non-NFS lands are evaluated based on past/present practices, management objectives, available information, and assumptions of probable/possible activities. Due to the lack of detailed data, effects from activities on non-NFS lands are difficult to quantify and qualify. They are therefore measured in more general terms than effects from activities on NFS lands.

For most wildlife species, the interaction of disturbance of forest vegetation (both human induced and naturally occurring) and forest succession determine the quality and quantity of habitat on a spatial and temporal scale. The existing condition and availability of habitat in the landscape will change regardless of management actions. This change could be sudden and readily apparent (e.g. a stand replacing wildfire) or slow and subtle (e.g. stand aging). As they pertain to this analysis, natural changes are random and unpredictable. Forest succession normally takes place at a rate that is essentially too slow to measure within the temporal scale of this project level analysis. However, because of its long-term effect and the existing condition of stands in the project area (e.g. ages close to but not yet mature) its effects will be discussed.

The fire history and human activities in the Stars and Sands wildlife analysis area and surrounding landscape have influenced the availability and distribution of wildlife habitat present today, particularly the level of late successional habitat and – indirectly - the acres of security.

At a landscape scale, land ownership patterns influence the availability of suitable habitat for some species, particularly species with large home ranges. For the St. Joe Geographic Assessment the district was delineated into Landscape Analysis Areas (LAA). The landscapes surrounding the Stars and Sands wildlife analysis area contain significant

amounts of non-NFS land (see Figure 1) including lands owned, managed and administered by: private timber companies, state agencies, and private individuals. The wildlife analysis area falls within 2 LAAs. The Sherwin Staples LAA is comprised of 63% non-NFS land. The northern portion of the Emerald LAA is non-NFS with additional large expanses of non-NFS to the north and northwest of the LAA.

The dominant influences (e.g. road densities, amount and distribution of forest structures) on the abundance and distribution of many threatened, endangered, sensitive, and management indicator species are the result of past and current management activities on both non-NFS and NFS land. The management objectives on most non-NFS forested lands emphasize timber management and much of the land owned by private individuals is not forested (e.g. open fields). Subsequently, these lands do not contribute to wildlife habitat such as mature/old forest structures or provide it at inherently low levels. Also, management objectives and practices on non-NFS lands tend to limit secure areas away from open/used roads. These landscape conditions then, regardless of conditions on NFS lands, not only influence the species present in the wildlife analysis area and the need to analyze potential effects, they also influence the methodology and level of analysis needed for an informed decision.

The nature and scope of the proposed actions and the associated potential impacts also influence the methodology of the analysis. For example, due to the location of the garnet resource, most potential impacts would be in and/or adjacent to streams and riparian areas. This then limits the area of potential impacts and limits (but doesn't necessarily eliminate) the need for detailed analysis outside of riparian areas.

Acre figures displayed in the wildlife section come from the TSMRS database. All data reflect the impacts from past actions. All values should be considered approximate due to such factors as rounding of acres and combining/grouping of stands. To facilitate analysis and to most accurately reflect habitat for some species it was necessary to combine size classes differently dependent on the species being addressed. Stand delineation and the resolution of that delineation in TSMRS may also affect how potential effects at a fine filter level are measured and displayed. For example stands adjacent to streams that may be classified as mature size class also include the narrow riparian habitat that may or may not be forested.

More specific discussions of analysis methods can be found under the section for each species or group of species.

Issue Indicators

Indicators and units of measurement for habitat and species based on habitat relationships are displayed in Table 3-18.

Table 3-18 - Indicators and Measurement of effects for Wildlife

Habitat/Species	Indicator of Effects	Measurement
Terrestrial Habitat		
Forest Structure	Amount and distribution of forest structural stages	Acres and percent of size classes.
Old Growth	Amount, patch size and distribution of old growth	Acres impacted and maintained; distribution; and FP standards
Riparian Habitat	Changes in riparian vegetation	Miles of riparian habitat impacted
Connectivity	Changes in forest vegetation in travel routes and impediments to movement	Changes in forest structure along ridges and riparian areas
Access	Changes in human access	Open and total road density
Disturbance	Changes in the amount of security and human activity levels	Acres of security and location and duration of activities
Cavity Habitat	Availability of potential habitat	Acres and % of immature and older forest structure
Management Indicator Species		
Pileated Woodpecker	Changes in suitable habitat	Acres of suitable habitat (size class) by home range
Elk	Changes in road effects and vulnerability	Road densities, acres of security and EHP
Moose	Changes in access and availability of wetland browse	Road densities and impacts to riparian/wetland habitat
Threatened and Endangered Species		
Gray Wolf	Changes in access, disturbance and prey availability	Road density and potential elk use
Bald Eagle	Changes in forest structure adjacent to large bodies of water	Miles and location of riparian impacts
Sensitive Species		
Fisher (and Marten)	Changes in suitable habitat, security, and travel opportunities	Acres of suitable habitat (size class), road density, and miles of riparian habitat impacted
Wolverine	Disturbance of denning habitat and security	Activity near potential denning habitat and road density
Northern Goshawk	Changes in suitable habitat and nest disturbance	Acres of suitable habitat (size class) and activity in nest stands
Black-backed Woodpecker	Changes in suitable habitat	Acres of suitable habitat (size class)
Coeur d'Alene Salamander	Disturbance of microhabitat	Potential sites disturbed
Boreal Toad	Impacts on breeding habitat and direct mortality	Impacts to riparian habitat and risk of mortality
Northern Leopard Frog	Impacts on breeding habitat and direct mortality	Impacts to wetland habitat and risk of mortality

The analysis of effects on species - if needed - will be tiered to the analysis of effects on the types/components of habitat displayed in the table.

Terrestrial Wildlife Habitat

This section of the analysis uses a medium/coarse filter level of analysis to display existing conditions and effects at the scale of the wildlife analysis area. Data displayed in this section will be used in the analysis for wildlife species and further analysis may not be needed for some species.

To measure, display and discuss the potential environmental consequences of the proposed action(s) and alternatives, it is beneficial to first describe/define the intensity and scope of the activities in context with the habitat in which the activity occurs and the habitat relationship of the species involved. For example the drilling of a 12" diameter test hole is rather innocuous in terms of its impact on forest structure, whereas the complete removal of vegetation clearly impacts existing forest structure. A discussion of potential impacts on wildlife and the rationale for environmental consequences (or lack thereof) from the various activities included in the proposed action(s) and alternatives can be found in the project file.

Forest Structure

Forest plant communities at various successional stages provide habitat for wildlife species. Some wildlife species are associated with high levels of dead and downed logs and late successional stages. Others are associated with combinations of young and late successional stages.

The St. Joe Geographic Assessment and the ICB Assessment revealed (at their respective scales) that there has been a decrease in late-seral habitat from historic levels. Many wildlife species addressed in this analysis are associated with this type of habitat. Therefore, one of the issues/concerns regarding potential impacts on wildlife and the proposed action and alternatives is the impact on the amount of late seral and old growth stands.

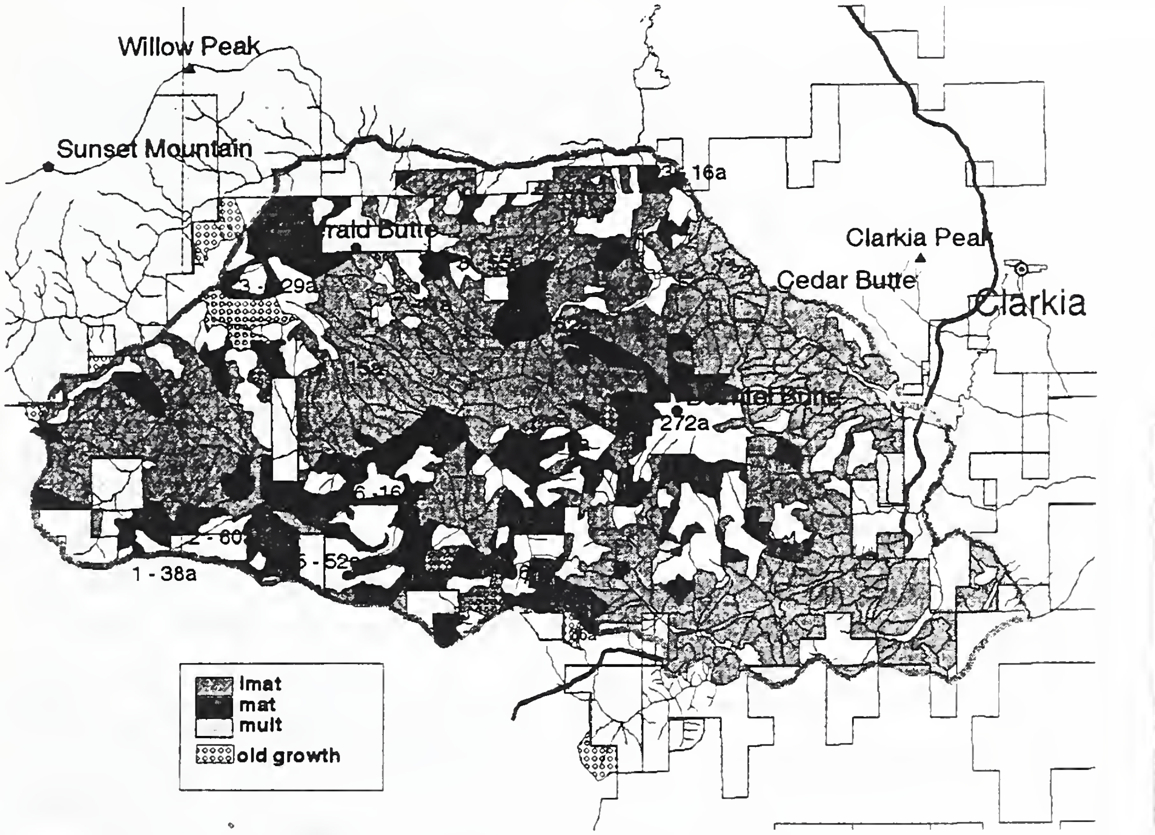
Existing Condition

Table 3-19 displays the existing vegetation by size class groups (on National Forest land) in the Stars and Sands wildlife analysis area.

Table 3-19 - Existing Vegetation by Size Class Group

Size/Structure	Acres	%
Mature/Old Forest	3,680	21%
Immature	9,777	55%
Multistory	305	2%
Pole	745	4%
Sapling	1,373	8%
Seedling/Open	1,739	10%

Figure 3-2 - Distribution of the old growth, mature, immature and multistoried stands



Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Recreational garnet digging would continue for approximately another .4 mile in 281 Gulch. This would remove approximately 25 trees but would not affect the suitability of habitat at a stand level and would not change the size class of any impacted stands. However, the cutting of an occasional tree or small groups of trees does entail a risk of adverse effects for some species (e.g. cavity nesting species) by disturbing individuals and/or direct loss of habitat. This risk is relatively small given the scope of the loss of a few trees compared to the acres of suitable habitat available. The impacts would not affect populations of any species.

Alternatives B and C

A combination of holes, pits, and/or trenches would be dug in various forest structures (non-stocked, pole, immature, and mature). Forest Service testing would entail up to approximately 360 holes/trenches, the Bechtel Butte lease – 5 to 6 pits, Prospecting permits

in: Hidden Creek -1 trench, Bechtel Creek - 2 trenches, E.F. Emerald Creek - 2 trenches, Catspur Creek - 6 trenches, Bechtel Butte - 3 trenches.

These actions may or may not include the occasional cutting of trees. The impacts from this activity would not change the size class of any stand and would not affect the suitability of habitat at a stand level. However, the cutting of an occasional tree or small groups of trees does entail a risk of adverse effects for some species (e.g. cavity nesting species) by disturbing individuals and/or direct loss of habitat. This risk is relatively small given the scope of the loss of a few trees compared to the acres of suitable habitat available. The impacts would not affect populations of any species.

The development of recreational garnet digging could result in the cutting of trees adjacent to 5.9 miles of stream over 7+ years. This would impact approximately 350 trees in 36 stands. This activity would occur in seedling through mature size classes. The impacts from this activity would not change the size class of any impacted stands. The risk of adverse effects from the potential loss of 300 trees - while higher than the risk associated with the digging of holes and trenches - is still relatively small at a stand/home range level.

The potential development of garnet sand mining would remove the majority of any existing forest structure on 25 acres adjacent to a tributary of the W.F. Emerald Cr. and on an area adjacent to the E.F. Emerald Cr.

The area of potential sand mining in the E.F. Emerald Cr. is approximately 10,000 ft. in length and varies in width from about 90' to 470'. The total area is calculated at roughly 40 - 50 acres. This area also contains the 8 acres included under the lease renewal. The impact from this activity would not be measurable using TSMRS data due to the existing stand delineations (see the wildlife analysis methods section). However, succession would be set back on impacted areas and most existing forest structure would be lost until re-established through reclamation efforts.

In the tributary of the W.F. Emerald Cr. there would be a reduction of 25 acres of immature forest structure. In the E.F. Emerald Cr. the impact would occur in the riparian area and approximately 6-8 ft. up from the toe of the slope. Based on field measurements, the riparian area varies in width from about 70' to 450 ft. Much of the riparian area is open with little to no tree canopy. This is in part due to past/present impacts from the existing road, the old railroad that used to be present, the parking facilities for recreational garnet digging, and/or natural conditions (e.g. beaver activity). Most existing vegetation in the riparian area would be eliminated. See the riparian habitat section later in this section for a finer filter analysis of impact on riparian habitat. Based on an 8 foot wide area (on both sides of the riparian area) for 10,000 ft. there would be approximately 4 acres of upland forest vegetation impacted. This would occur in about 0.7 acre of mature forest structure, 3 acres of immature forest structure, and 0.1 acre of pole forest structure.

Existing forest structure in the riparian area that is not separated from adjacent upland stands would also be impacted (approximately 40 – 50 acres in Alternative B and 26 – 36 acres in Alternative C). The 30 foot buffer in Alternative C would decrease the amount of impact on

approximately 14 acres. This would not be measurable at this level of analysis (i.e. using TSMRS data) but would result in an appreciable difference between alternatives B and C.

Table 3-20 displays the potential cumulative impacts on forest structure by alternative as measured by acres and percent of the analysis area in each size class.

Table 3-20 - Potential Cumulative Impacts on Forest Structure

Size/Structure	Existing		Alt. A		Alt. B and C	
Mature/Old Forest	3,680	21%	3,680	21%	3,679	21%
Immature	9,777	55%	9,777	55%	9,749	55%
Multistory	305	2%	305	2%	305	2%
Pole	745	4%	745	4%	745	4%
Sapling	1,373	8%	1,373	8%	1,373	8%
Seedling/Open	1,739	10%	1,739	10%	1,768	10%

Table 3-20 includes impacts on 25 acres of existing immature forest structure from an uncut unit in an existing timber sale. There are no other reasonably foreseeable activities on NFS lands that would impact forest structure.

It is expected that the majority of non-NFS land would be actively managed and therefore would not contribute to the amount of mature/old forest structure in the analysis area.

Succession and natural disturbances would continue to occur at levels that can not be reasonably measured. Most stands unaffected by activity would becoming older and contain larger trees. Insects and disease, wind, and other causes of natural tree mortality would continue to impact the structure of forested stands.

Old Growth

As an objective to help provide for a diversity of plant and animal communities the Forest Plan (page II-5) states that "Approximately 10 percent of the Forest will be maintained in old growth as needed to provide for viable populations of old growth dependent and management indicator species. To obtain the desired distribution, the IPNF will be managed to maintain approximately 5 percent of each old-growth unit as old growth where it exists." As part of a Forest wide process the District(s) identified stands meeting old growth criteria. Stands were then allocated to old growth management to comply with Forest Plan standards (e.g.10% with minimum of 5% in OGMU).

Existing Condition

The Stars and Sands wildlife analysis area contains all of 1 old growth management unit (OGMU) and a portion of 3 other OGMUs. In one of the OGMUs there are only about 160 acres of NFS land and no allocated (or replacement) old growth in the wildlife analysis area. Therefore, the analysis of old growth will address further only the 3 OGMUs that have old growth within the analysis area.

During the old growth allocation process there were 1,939 acres in the wildlife analysis area that were identified as meeting the North Idaho criteria for old growth. Of these, 1,885 acres

were allocated to old growth management; this represents a little more than 10% of the NFS land in the wildlife analysis area.

Table 3-21 displays the acres of allocated old growth and percentages allocated by OGMU. The data in the table represents NFS lands only.

Table 3-21 - Allocated Old Growth

OGMU	Allocated O-G in Analysis	Allocated O-G in OGMU	% of OGMU Allocated	Non-allocated O-G in OGMU
1	163a	501a	6%	0
5*	1,369a	1369a	16%	54a
14	408a	994a	10%	0

* This OGMU is entirely within the Stars and Sands wildlife analysis area.

Forest Plan standards for old growth are being met within each OGMU and across the St. Joe Ranger District.

The integrity and effectiveness of old growth stands as habitat is influenced by patch size and the condition of adjacent stands. For example, when an opening exists or is created next to an old growth stand, the environmental changes created by the opening penetrate into the old growth.

Fire and topographic diversity in the west (and the St. Maries River drainage) have historically combined to produce a temporally dynamic, naturally fragmented landscape (Dobkin, 1992). Natural patch sizes and differences in structure (e.g. edge) resulting from the interaction of disturbance and succession varied considerably. Patch sizes ranged from less than an acre to areas that covered subdrainages. The resulting landscape was complex, with the patterns of vegetation being a function of the frequency and severity of disturbance, environmental gradients, soil potential, seed source and other factors.

The existing old growth (i.e. allocated old growth and non-allocated old growth) in the wildlife analysis area occurs in 13 patches ranging in size from 15 to 560 acres with a variety of configurations (i.e. round, linear, convoluted shapes). The stands adjacent to the old growth vary from recent clear cuts through mature forest stands. There are 2 patches less than 25 acres, 6 patches between 25 and 80 acres, 3 patches between 80 and 300 acres and 2 patches greater than 300 acres (for comparison to desired characteristics in the Forest Plan).

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

There would be no management-initiated change in old growth. There are no foreseeable changes on non-NFS lands at this time.

Direct and Indirect Effects

Alternatives B and C

Under the lease application, hand dug and/or machine dug pits (5 + or -) would be dug in old growth. This would most likely include the cutting of some trees to facilitate the digging. The activity/impacts would be undesirable and inconsistent with management of the stand(s) as old growth. This activity would affect individual trees but would not affect the criteria for meeting the old growth definition at a stand level.

If developed, garnet sand mining would occur in the E.F. of Emerald Creek adjacent to 1 patch of old growth (allocated). This patch is 152 acres. The clearing of trees upslope from the toe of the slope would reduce the amount of old growth by approximately 0.15 acre. This activity would affect a portion of the stand and would increase the existing opening (i.e. an open road) adjacent to old growth.

Cumulative Effects

All impacts on old growth occur in OGMU 5. The activity/impacts would be undesirable and inconsistent with management of the stands as old growth. However, Forest Plan standards allow for harvest of existing old growth when there is more than 5 percent in an OGMU and the Forest total is more than 10 percent. The impacts would have an inconsequential effect on patch size and would not change the percent in the OGMU. Forest Plan standards for old growth management would be met.

Riparian Habitat

Riparian areas provide potential habitat for many wildlife species including: boreal toads, Coeur d'Alene salamanders, and bald eagles. Riparian areas also are used as travel routes by species such as fisher/marten and provide special habitat components such as wallows for elk.

Disturbance of riparian areas can alter the value and kind of habitat available. The impacts on habitat and the consequences of disturbance vary dependent on the type of disturbance. For example effects from the potential development of commercial mining in which the riparian area is dug up (and reclaimed) would be more of an impact than the digging and filling in of test pits.

For the purpose of this analysis, 2^{nd} order streams (and greater) with approximately 320 acres or more of drainage area are used to measure potential effects on riparian habitat. This allows for an assessment of the potential impacts on those riparian areas with the highest probability of providing suitable habitat for wildlife and the highest probability of exhibiting distinguishable habitat differences with adjacent upland habitat. To assure that all areas of potential impact are evaluated, 1^{st} order drainages that may be impacted by proposed activity are included in the analysis.

The impacts to riparian habitat are measured in miles. This coincides with the linear nature of the habitat. The variability in the width of riparian habitat makes it impracticable to use acres and measurement of riparian habitat in miles allows for an informed decision.

Existing Condition

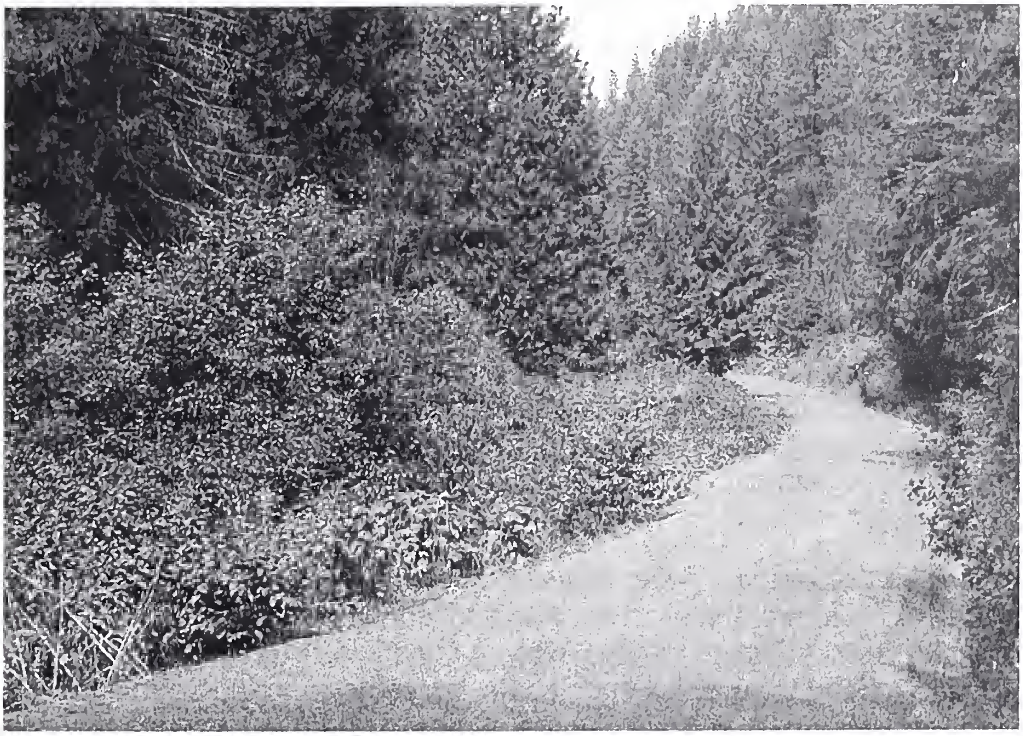
Field review, aerial photos and historic information reveal that riparian vegetation in the Stars and Sands wildlife analysis area has been impacted by human activities such as past/present mining, historic timber harvest (e.g. prior to 1960s), roads, old and existing railroads, recreation, and cattle grazing. Some past impacts and their effects are obvious (e.g. existing roads, recent mining). Evidence of some past impacts are less apparent and the effects have or appear to have been lessened by time (e.g. old roads, old timber harvest).

There is a wide range in the existing condition of riparian habitat in the analysis area, both natural and human caused. Some riparian areas are flat and relatively wide zones (>100') others are narrow and virtually indistinguishable from adjacent upland habitat. Vegetative conditions range from open to forested. Open areas include areas impacted by human activities (e.g. mining, roads, and grazing) and apparently natural openings of grasses/sedges, forbs and shrubs as a result of fire, beavers, and other factors.

The following pictures provide examples of conditions adjacent to the E.F. of Emerald Creek, in areas where potential development of garnet sand mining may occur.

Figure 3-3 - Wider riparian zones with more open conditions

Figure 3-4 - Narrower riparian zone with more vegetated conditions



There are 59.7 miles of stream that will be used to measure impacts on riparian habitat. Table 3-22 displays the existing condition and past/present impacts on the miles of riparian habitat measured for this analysis.

Table 3-22 - Condition and Impacts of Riparian Habitat

			Evidence of or known Past/Present Impacts			
Existing Vegetatio	Total miles	Road present*	Grazing	Mining (sands)	Mining (gems)**	None obvious
Forested	35.4	4.4			3.4	32
Open	24.3	6.6	7.5	6.0	.7	10.1
Total	59.7	11.0	7.5	6.0	4.1	42.1

* The data in this column displays the miles of stream that have an existing road paralleling the stream in or adjacent to the riparian zone.

**The miles of actual impact is less than displayed here. The exact length of riparian area dug in is not known, the figure includes the entire length of impacted segments.

Environmental Consequences

Garnet sand mining would continue in the W.F. of Emerald Creek on non-NFS lands. However, known activity is outside of the wildlife analysis area. The following table displays

the cumulative changes in riparian conditions (in miles) that would result from the proposed action(s), potential development, and reasonably foreseeable actions.

Table 3-23 - Cumulative Changes in Riparian Conditions

	Existing		Alt. A		Alt. B and C	
Riparian Condition	forested	open	forested	open	forested	open
Riparian miles	35.4	24.3	35	24.7	30.2	29.5

Direct, Indirect and Cumulative Effects

Alternative A

The continuation of recreational digging for garnet gems in 281 Gulch would change approximately .4 mile of riparian habitat from an existing forested condition to an open condition. Overburden removal would disturb the ground in virtually the entire riparian area and remove most forest vegetation. This would take place at a rate that impacts approximately 200 – 300 feet/year.

Following the completion of yearly digging in a section the site would be rehabilitated. Rehabilitation would not return the sites to their original condition and in most cases the vegetation would take years to return to near existing conditions. Based on review of past rehabilitation, riparian habitat for species such as the boreal toad would be maintained. Surveys of past rehabilitated sites (Forest Service and private) have shown that species such as the boreal toad, spotted frog, long-toed salamander are present in the rehabilitated sites (project file). Based on species presence at sites that have been rehabilitated, the consequences of this disturbance are not expected to adversely effect populations of any species.

Alternatives B and C

There would be no impacts on riparian areas from the lease application on Bechtel Butte or from the prospecting permit on Bechtel Butte. There would be no change in miles of road present or in areas impacted by grazing from any activity in the proposed action.

Forest Service testing would create up to 360 holes, pits, and/or trenches dug in riparian habitat within 6 drainages and about 6.4 miles of riparian habitat. There would also be about 9 test trenches dug in riparian habitat under the prospecting permits – in Cat Spur Creek, Hidden Creek, Bechtel Creek, and the E.F. Emerald Creek.

The impacts from these activities would be small in nature and scope and would not appreciably affect the riparian area. However, the physical disturbance of ground in the riparian area does entail a risk of adverse effects for some species (e.g. boreal toad) by disturbing individuals and/or direct loss of habitat. This risk is relatively small given the scope of the area of direct disturbance compared to the acres of suitable habitat available. The impacts would not affect populations of any species.

The development of recreational digging for garnet gems would change approximately 4.2 miles of riparian habitat from an existing forested condition to an open condition. Anticipated

overburden removal associated with recreational digging would disturb the ground in virtually the entire riparian area and remove most forest vegetation. This would take place at a rate that impacts approximately 200 – 300 feet/year. Recreational garnet digging with overburden removal would occur in approximately 5.4 miles of riparian area. Existing conditions on the 5.4 miles includes 4.2 miles of forested vegetation (pole size or larger) and 1.2 miles of open vegetation. The open conditions are a result of past gem mining, beaver dams, roads, and possible historic logging.

Following the completion of yearly digging in a section the site would be rehabilitated. Rehabilitation would not return the sites to their original condition and in most cases the vegetation would take years to return to near existing conditions. Based on review of past rehabilitation, riparian habitat for species such as the boreal toad would be maintained. Surveys of sites that have been rehabilitated (by the Forest Service and private mining company) have shown that species such as the boreal toad, spotted frog, long-toed salamander are present in the rehabilitated sites (project file). Based on species presence at sites that have been rehabilitated, the consequences of this disturbance are not expected to adversely effect populations of any species.

Alternative B

The potential development of garnet sand mining would completely turn over ground adjacent to a tributary of the W.F. Emerald Cr. and an area adjacent to the E.F. Emerald Cr. The activity in the W.F. Emerald Creek would impact approximately ½ mile of riparian area (total area of 25 acres). The riparian area impacted in the E.F. Emerald Cr. is approximately 1.9 miles in length (varying in width from about 70' to 450' and totaling approximately 40 – 50 acres). This area also contains the 8 acres included under the lease renewal. Following mining reclamation of the site would occur.

The potential development of garnet sand mining would change ½ mile in the tributary of the W.F. Emerald Creek and ½ mile in the E.F. Emerald Creek from a forested to an open condition.

Commercial mining of garnet sands would disturb most if not all of the riparian area where activity occurs. During active mining and prior to reclamation there would be little to none of the existing riparian habitat available for wildlife. The area would remain in an open forest structure condition for over 10 years. In the E.F. Emerald Creek this would impact approximately 1,000 – 1,500 ft. per year for 7 – 10 years. In the W.F. Emerald tributary this would affect approximately 1,000 – 1,500 ft. per year for 2 years.

Much of the riparian area in the E.F. Emerald Creek is open with little to no tree canopy. This is in part due to past/present impacts from the existing road, the old railroad that used to be present, the parking facilities for recreational garnet digging, and/or natural conditions (e.g. beaver activity). Most existing vegetation in the riparian area would be eliminated. The riparian area would remain open until vegetation becomes re-established.

Alternative C

The potential effects from the potential development of garnet sand mining in the tributary to the W.F. Emerald Creek and in the E.F. Emerald Creek would be similar to those in

Alternative B. However, the 30 foot buffer along both streams would lessen the area of impact and reduce the acres impacted (by approximately 14 acres) under Alternative B.

The buffer would retain some of the riparian habitat values in portions of riparian miles impacted by activities. The undisturbed areas in the buffers would provide places of refuge and possible sources for re-population of rehabilitated riparian habitat.

Access/Disturbance

Most potential adverse impacts from human disturbance are associated primarily with access levels and roads. Effects on wildlife are caused by roads themselves and by the increased contact with humans that they afford. High levels of open roads (or roads and trails used by motorized vehicles) can affect wildlife species by displacing them from preferred habitats for one or more seasons and/or increasing their vulnerability to mortality. The ICB Assessment identified that those species vulnerable to human disturbance have relatively low amounts of secure habitat. The St. Joe Geographic Assessment also identified security as a concern.

The degree of effects on wildlife from roads is related to the amount and type of use on them. For the purpose of assessing impacts on wildlife from roads on NFS land, only roads that impact wildlife are included in the wildlife analysis. For example roads that do not provide for motorized access do not appreciably increase vulnerability.

The ICB Assessment categorized road density levels (expressed as mi/mi^2) of 0.7 - 1.7 as moderate, 1.7 - 4.7 as high and more than 4.7 as extremely high. The ICB assessment also found a great deal of ambiguity about the amount of road access needed to satisfy public needs. Road density goals for wildlife vary depending on the species, the area under consideration and the objectives and designation assigned to the drainage. For example, there is a high risk to trapping-vulnerability for fisher and marten when road densities are more than 1 mi/mi^2 (IDFG, 1995).

Many wildlife species are sensitive to human disturbance and/or adversely impacted by human access. Potential temporary disturbance of wildlife is inherent in most human activity and may include alteration of normal use patterns and potential relocation to avoid disturbance (e.g. using alternate forage areas). This type of disturbance is not based on loss or long-term alteration of habitat. Because of its usually limited implications and constant background disturbance (e.g. from non-NFS activities) in most situations this would not appreciably affect suitability of habitat or populations. However, given the nature and the duration of some potential developments (e.g. 10 years of activity in the E.F. Emerald drainage) in the proposed action(s), the potential for long-term disturbance may be of concern.

Existing Condition

Access - In the wildlife analysis area there are approximately 117 miles of road that may impact wildlife by providing access. For the wildlife analysis this results in a total road density in the Stars and Sands wildlife analysis area of 3.7 mi/mi^2. There are approximately 46.5 miles of open road that results in an open road density of 1.5 mi/mi^2.

Disturbance - Although it is difficult to quantify, disturbance is associated primarily with open roads and their juxtaposition on the landscape. Existing disturbance in the wildlife analysis area comes from the following sources:

- Current Timber Sales - on NFS and non-NFS lands
- Current commercial mining activity
- Current recreational mining activity (281 Gulch)
- Grazing allotment activity
- General Forest use (e.g. recreating, hunting, camping, firewood gathering, etc.)
- Other uses (e.g. fire suppression)

For the purposes of measuring disturbance, 34 “subdrainages” were delineated based on the objective of measuring existing/potential disturbance and topographic features. Of the 34 subdrainages delineated, 16 have less than 100 acres of security within their boundaries. Currently 1 subdrainage has recreational mining occurring. Harvest in existing Forest Service Timber Sales is complete; post sale activity (e.g. site preparation and planting) will contribute a low level of disturbance for approximately 2 – 4 years. Existing commercial mining on non-NFS land is impacting 3 or 4 subdrainages. This includes subdrainages adjacent to existing open roads used for hauling.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Common to all Alternatives

Access - There would be no change in road densities and no change in access. All activities in alternative B and C would be done using existing open roads. The possible temporary relocation of road segments associated with commercial garnet sand mining would not appreciably change the miles of road.

Alternative A

Disturbance - There would be no management-initiated change in disturbance. The disturbance from recreational digging in 281 Gulch would remain at or near existing levels but would move as the digging moves down the drainage. The disturbance is/would be localized and limited to a relatively small area by topography and forest vegetation. Wildlife are/would be able to avoid the disturbance and any effect is/would be relatively innocuous.

Alternatives B and C

Disturbance - Forest Service testing, and approval of prospecting permits would constitute a temporary and low level of disturbance. Approval of the lease on Bechtel Butte would also constitute a low level of disturbance over a longer period. Recreational mining at Forest

Service sites would maintain the existing level of disturbance. However, the location of this low level disturbance would change.

The above disturbances would be localized and limited to a relatively small area by topography and forest vegetation. Wildlife would be able to avoid the disturbance and any effect would be relatively innocuous.

There would be no increase in the number of subdrainages with disturbance. The potential development of mining in the E.F. Emerald Creek and the tributary to the W.F. Emerald Creek would increase disturbance levels adjacent to existing open roads. This disturbance would be seasonal and occur only during period of active mining (i.e. during working hours). There would also be an increase in traffic levels on segments of existing open roads (of approximately 7 – 10 trucks/day). Topographic barriers and forest vegetation would limit the area of impact to a corridor adjacent to stream segment being worked in.

The proposed action(s) would increase the intensity of existing disturbance and may increase the area of influence from disturbance within the wildlife analysis area. This would occur primarily in areas of activity associated with the potential development of mining in the E.F. Emerald Creek. The potential increase in disturbance would constitute a shift from the current disturbance due to garnet sand mining that is occurring outside of the wildlife analysis area (e.g. Carpenter Gulch) to disturbance inside the analysis area as the location of mining changes.

Connectivity

The spatial arrangement of existing forest structure, human settlements, land uses (e.g. grazing/pastures and log landings), and roads affect movement of wildlife.

Loss of cover on areas >300 ft (IDFG, 1995) in width that may create an impediment to travel/movement will be measured and compared to the existing condition and potential travel routes identified in the analysis area. The potential for the alteration/restriction of movement and the maintenance of potential movement opportunities will be discussed.

Existing Condition

The effects of past and present actions that created/maintain openings and natural riparian open areas continue to affect and alter wildlife movement in and through the analysis area.

Review of historic photos (c. 1933) and other sources (e.g. various maps) indicate that: (1) relatively wide and open riparian areas adjacent to segments of some streams (e.g. Emerald Creek) occurred prior to the 1930s, and (2) fires created large expanses of open forest conditions. These areas would have (and still do) influence movement of some wildlife species (e.g. fisher) in the analysis area.

Past harvest (on both NFS and non-NFS land), existing roads (e.g. State Highway 3), and other human activities (e.g. human residences) are also affecting connectivity/travel corridors for some species.

Areas typically used by wildlife for travel include ridges, riparian areas, and saddles. Prominent ridges that provide potential corridors and connectivity have been mapped (project file). Areas that may create an impediment to travel for some species have also been identified and mapped (project file).

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet digging in 281 Gulch would further affect the riparian area's potential to provide opportunities for wildlife to travel along it and would increase the length that is unsuitable. There would be no area greater than 300' of opening created. There would be no affect on other areas typically used by wildlife for travel or on identified potential travel areas. Connectivity within and between drainages would be maintained near existing levels.

Direct and Indirect Effects

Alternatives B and C

Forest Service testing and recreational digging, approval of the lease on Bechtel Butte, and approval of prospecting permits would not create any loss of cover (i.e. >300 ft. wide) that may impede travel/movement of wildlife.

Forest Service recreational digging would affect the riparian area's ability to function as travels ways along 281 Gulch, Garnet Gulch, Pee Wee Creek, No Name Creek and Wood Creek (where overburden removal is anticipated. This would be expected to alter wildlife movement. However, opportunities for movement adjacent to the riparian area would be maintained in the vicinity of each affected riparian area.

The potential development of mining in the tributary to the W.F. Emerald Creek would create open conditions that may alter wildlife movement. This impact would not affect any area identified for this analysis as a potential area for movement and alternative areas for movement in the vicinity would remain unaffected.

The potential development of mining in the E.F. Emerald Creek would create more open conditions (i.e. existing shrubs and sparse tree cover would be replaced by open ground), increase the width of existing open areas (primarily due to the mining 6-8 feet up from the toe of the slope) and perpetuate existing open conditions.

Areas of impact that are >300 ft. are in an existing open condition from past activities (e.g. roads, past mining). Within 7 - 10 years 10 lengths of the riparian area in the E.F. Emerald Creek would be devoid of cover. Although much of this length is currently open and impacted by the existing open road, this would further reduce the riparian areas ability to function as a travel way for species that prefer overhead cover such as fisher and marten.

Riparian areas in the E.F. Emerald Creek that are not mined would maintain their existing potential for wildlife travel/movement. One of the identified areas of travel would be partially bisected by the mining. However, the area is in an existing open condition and the potential to provide for movement of wildlife is already compromised if not lost. The existing open condition of much of the E.F. Emerald Creek would be perpetuated. While the 30 foot buffer on the E.F. Emerald Creek and the tributary to the W.F. Emerald Creek would tend to reduce adverse impacts on connectivity, any difference between alternative A and B is not quantifiable.

While there would be adverse impacts on the potential for travel/movement of wildlife, areas providing potential for travel/movement would remain and there would be no consequential effect on connectivity.

Cumulative Effects

Existing conditions that impede movement would remain. Connectivity and travel opportunities for wildlife movement in and through the analysis area would be altered. However, due to the existing condition of impacted areas, there would be little change in connectivity. Opportunities for movement would be maintained.

Cavity Habitat

The amount of snags and down woody material present has been identified as a measure of forestland integrity (Quigley et. al. 1996). Snags of varying size, condition, and tree species provide habitat for a variety of wildlife species. The species totally or largely dependent on cavity habitat include some sensitive (e.g. black-backed woodpecker, flammulated owl) and management indicator species (e.g. pileated woodpecker).

Existing cavity habitat is a function of past and present disturbances (e.g. fire, insects, disease, and timber harvest), stand initiation, and succession.

Providing numbers of snags that have been shown to support viable populations is a prudent approach to managing for viable/sustainable populations of woodpeckers and other species that use snags. Recent studies indicate that viable woodpecker populations occurred in areas with about four snags per acre (Bull et al. 1997). Bull et al. (1997) recommends providing snags in every 5 to 25 acre stand to satisfy distribution needs.

Cavity habitat for this analysis was measured by assigning approximate levels of habitat potential based on the size class of stands and the presence or lack of stand activity as recorded in TSMRS. Immature and larger size class stands with no activity were considered to be at or near 100% of potential, pole size stands and immature size + stands with past management activities were considered to be somewhere less than 100% of potential and sapling and smaller stands were considered to be from 0% - 60% of potential (based on snag retention in recent harvest units).

Existing Condition

Table 3-24 - Existing Cavity Habitat Potential

Size Class	Cavity Habitat Potential					
	0% - 60%		<100%		~100%	
	acres	%	acres	%	acres	%
≥Immature	-	-	651	4%	13,092	74%
Pole	-	-	745	4%	-	-
≤Sapling	3,112	18%	-	-	-	-

The acres for ≤sapling size stands includes naturally open areas that would not normally contribute to cavity habitat.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet digging in 281 Gulch would result in the potential loss of a low number of trees that may include existing snags and/or trees providing cavity habitat. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not affect populations of any cavity dependent species.

Direct and Indirect Effects

Alternatives B and C

Forest Service testing and recreational digging, approval of the lease on Bechtel Butte, and approval of prospecting permits would result in the potential loss of a low number of trees that may include existing snags and/or trees providing cavity habitat. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not likely affect populations of any cavity dependent species.

The potential development of garnet sand mining would adversely impact cavity habitat. Approximately 4 acres of upland habitat adjacent to the E.F. Emerald Creek and 25 acres in the tributary to the W.F. Emerald Creek would be reduced from near 100% of potential to 0% cavity habitat potential. At the analysis area level this would not cause a measurable change in the per cent of cavity habitat potential.

Approximately 40 - 50 acres of riparian habitat adjacent to the E.F. Emerald Creek in Alternative B and 26 – 36 acres in Alternative C would have the vast majority of existing cavity habitat removed. This area is primarily in an existing open condition and is calculated at < 60% of potential. This impact is not measurable at the analysis area level.

In all alternatives some snags (i.e. cavity habitat) would be lost. However, areas outside of proposed garnet mining areas would continue to provide snags at existing levels in the short

term and the number of snags and down woody material in these areas would increase as stands succeed.

Cumulative Effects

Alternatives B and C

The proposed action(s) would not significantly affect cavity habitat at the subdrainage and larger scale. Therefore the contribution to cumulative effects would not be consequential. Forest Plan standards would be maintained.

Management Indicator Species

Management Indicator Species (MIS) are species selected to estimate the effects of management activities on wildlife populations. The Forest Plan identified the MIS for the Forests. They include several categories of species including: threatened, endangered and sensitive, commonly hunted or trapped, and species whose population changes are believed to indicate effects of management on other species or biological communities. In this analysis TEandS species have been addressed separately. The two other categories will be addressed in this section. Those species from the IPNF Forest Plan that are applicable to the St. Joe District and project area are displayed in Table 3-25.

Table 3-25 - Wildlife MIS for the St. Joe District

Species	Remarks	Existing Habitat
Marten	Trapped, associated with late successional mesic conifer forest habitat.	Habitat exists; analysis is documented in section with fisher.
Pileated Woodpecker	Primary cavity excavator, dependent on large snags associated with late successional habitat.	Habitat and species present, further analysis will be completed.
Elk	Hunted, important big game species, affected by human disturbance and human use of roads.	Habitat and species present, public issue, further analysis will be completed.
Moose	Hunted, relatively unique big game species, occurs in low numbers throughout the IPNF.	Habitat and species present, elk analysis meets most analysis needs. Further analysis tied to riparian/wetland habitat will be completed.

Old Growth Associated MIS

Pileated Woodpecker

The pileated woodpecker is an old growth indicator because of its strong tie to the availability of large snags. Pileated woodpeckers require tall, large-diameter dead or live defective trees within forested stands for nesting (Warren, 1990). Nest trees average nearly 30 inches; the minimum nest tree diameter is 20 inches.

Carpenter ants make up the bulk of their diet. Feeding habitat includes large snags with advanced decay, the moist decaying butts of live trees, logs greater than 10 inches diameter, and natural or cut stumps.

Large trees, canopy cover and the number and size of feeding sites (e.g. dead trees greater than 10 inches diameter) are all important features of quality pileated habitat (Aney and McClelland 1990, B. McClelland, 1993). Activities that reduce these habitat features would reduce pileated habitat suitability.

Methodology and Geographic Scope

The analysis of effects on pileated woodpeckers is based on direction in *Old-Growth Habitat and Associated Wildlife Species in the Northern Rocky Mountains* (USDA, 1990) and is tiered to the analysis done for size class and old growth. The geographic scope for direct, indirect, and cumulative effects is the wildlife analysis area.

Specific data in the form needed to fully use the Region 1 Habitat Suitability Index (HSI) models developed for pileated woodpecker is not available (e.g. number of snags by tree diameter, stumps greater than 3 feet tall). Habitat values from the HSI models and TSMRS data were used to identify potentially suitable habitat and assess the potential for effects.

The analysis methodology for determining potential effects on pileated woodpeckers involved mapping old growth and mature forest stands (i.e. potentially suitable nesting habitat) and delineating hypothetical 1,000 acre home ranges around suitable nesting stands/groups of stands (Figure 3).

Based on relative habitat values and the acres of suitable nesting habitat a home range should have (USDA, 1990), areas with at least 100 acres of contiguous mature/old forest habitat and an additional contiguous 100 acres of mature and/or immature/large tree habitat were identified as having sufficient suitable nesting habitat.

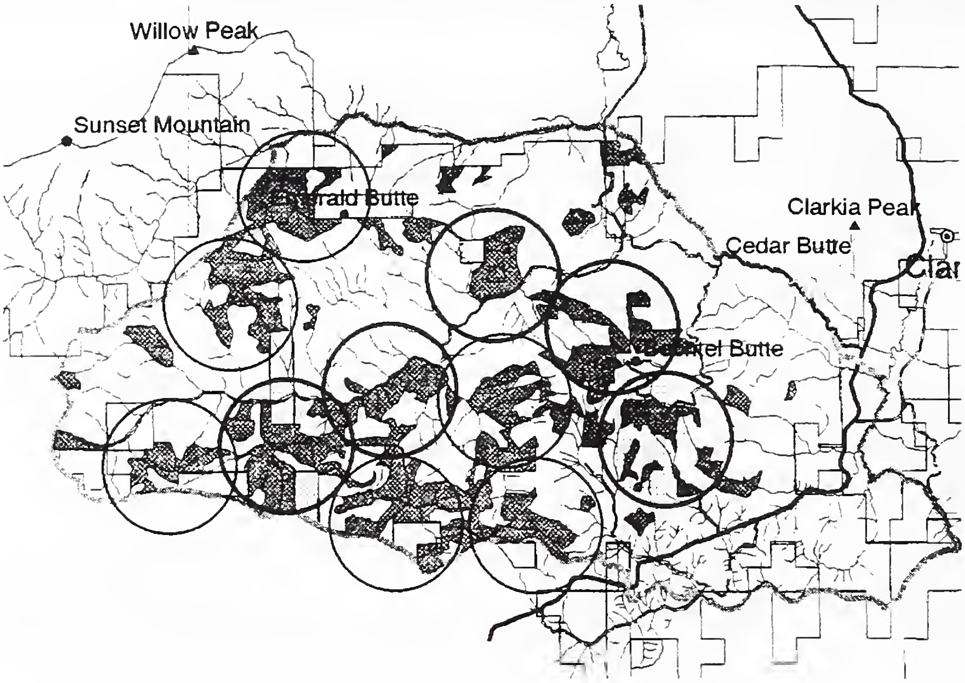
Once home ranges with suitable nest stands were identified, the suitability of surrounding stands in the home range to provide adequate feeding habitat was evaluated. Within each home range at least 500 acres of mature/old forest and/or immature/large tree habitat is needed to provide adequate feeding habitat. Impacts on suitable habitat will then be determined for each home range and compared by alternative.

Existing Condition

There are 1,885 acres of allocated old growth in the wildlife analysis area. Forest Plan standards for old growth are being met across the St. Joe Ranger District. Approximately 21 percent (3,680 acres) of the National Forest System land in the Stars and Sands wildlife analysis area is large/mature/old forest. These stands (along with stands in the "immature" size class) provide structure and attributes of habitat used by pileated woodpeckers.

A total of 11 home ranges on NFS land were delineated (see Figure 3-5). All 11 of these home ranges contain sufficient feeding habitat (project file).

Figure 3-5 – Pileated Woodpecker Home Ranges



Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet digging in 281 Gulch would result in the potential loss of a low number of trees that may include existing snags and/or trees providing cavity habitat. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable pileated woodpecker habitat or affect pileated woodpecker populations.

Direct and Indirect Effects

Alternatives B and C

Five of the identified home ranges contain activities from the proposed action(s) within their boundaries. Bolder lines in Figure 3-5 identify these home ranges.

The proposed action(s) would impact less than 2 acres of suitable upland habitat in each home range. Sufficient suitable habitat to support pileated woodpeckers would remain in all home ranges. There would be no measurable effect on pileated habitat. The previous analyses of size class and cavity habitat also indicate that effects on habitat for pileated woodpeckers would be negligible.

Cumulative Effects

Alternatives B and C

The proposed action(s) would not contribute to existing cumulative impacts. There would be no projected effect on populations. Forest Plan standards would be maintained.

Elk

Elk are an important big game species on the St. Joe District and within the analysis area. Elk were identified in the Forest Plan as general forest seral species easily affected by management activities. Land management activities, particularly timber harvest and associated roads affect elk habitat quality, potential elk use of habitat, and elk mortality from hunting.

Methodology

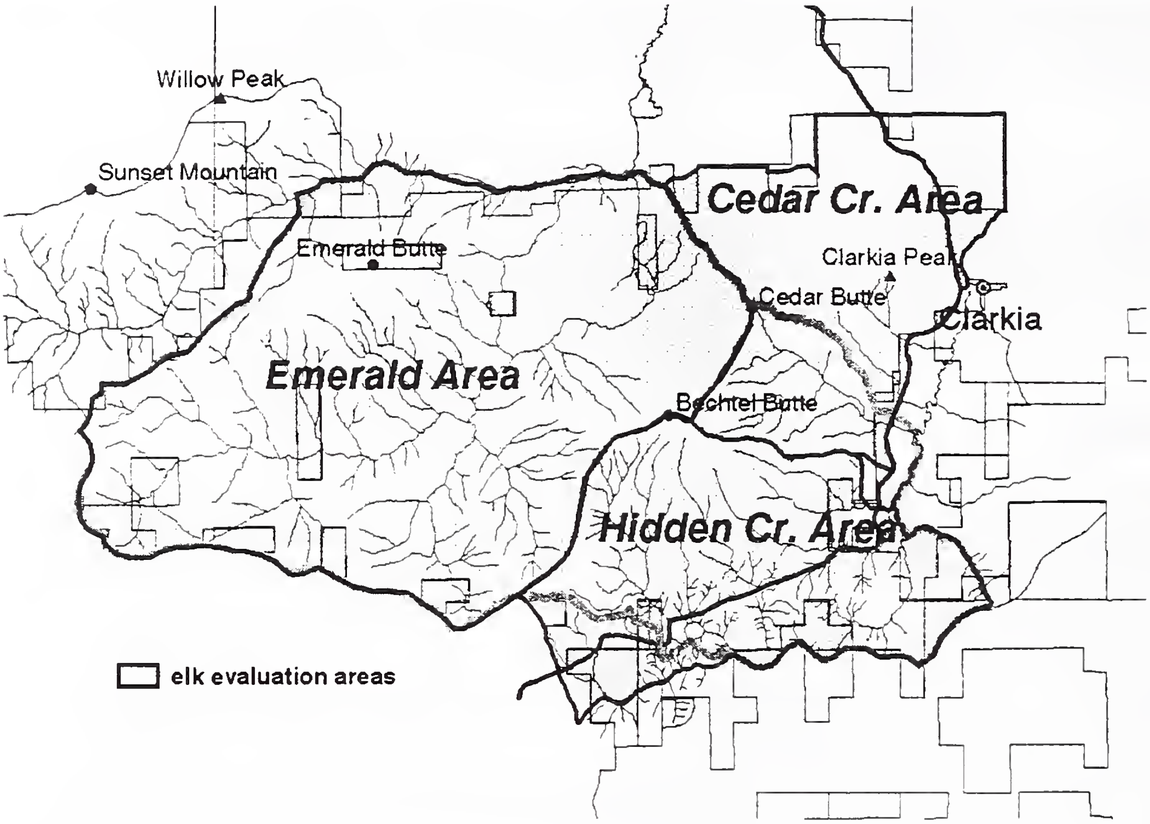
The most important factor usually regulating use of habitat by elk is disturbance by people. Most disturbance (and hunting mortality) is related to roads (Leege, 1984). The commonly used analysis methodology from the *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* (Leege, 1984) evaluates various factors affecting elk habitat quality and assigns a numerical rating. Factors evaluated include: roads, security acres, cover, forage, and livestock. This rating is used to determine elk habitat quality (expressed as a percent of potential elk use or elk Habitat Potential - EHP). However, based on the proposed action(s) and the analysis of potential effects on vegetation and access, there would be no measurable change in elk habitat due to road effects, security acres, cover or forage. The proposed action(s) do not propose changes in livestock grazing levels. There would be no measurable change in any of the factors affecting elk habitat quality. Using the methodology in *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho* would not provide any information helpful in analyzing/comparing the potential effects or useful for making a decision. Therefore, this methodology will be used only to display conditions based on existing information (i.e. Hidden Cedar EIS and Emerald Resource Unit EIS).

The potential for impacts on elk is from changes in the level and location of disturbance associated with the proposed actions (e.g. the operation of heavy equipment and changes in traffic levels on existing open roads). The effects on elk will be measured by the changes in the location of disturbance by drainage/subdrainage and by the changes in traffic levels.

Geographic Scope

The analysis for elk habitat will be displayed/discussed at 2 different scales. Existing EHP will be disclosed for the Hidden Cedar elk assessment areas and for the assessment area used in the Emerald Resource Unit EIS (see Figure 4). Disturbance of big game will be analyzed in the wildlife analysis area for the Stars and Sands project.

Figure 3-6 – Elk Evaluation Areas



Existing Condition

Timber harvest in the sales that resulted from the Emerald Resource Unit EIS has been completed. Post sale activity such as planting and sale area improvement projects have not been entirely completed. Based on the analysis done for the Emerald Resource Unit EIS (c. 1994), the existing EHP in that area was projected to be approximately .46 following completion of all activities. Based on the analysis done for the Hidden Cedar Project EHP in the Cedar Cr. evaluation area is .47 and in the Hidden Cr. evaluation area is .44.

Disturbance from Forest Service administered recreational mining occurs in 281 Gulch. This disturbance is limited in nature and scope due to the fact that motorized access is restricted beyond existing open roads.

Existing commercial mining is currently occurring in the West Fork of Emerald Creek, which forms the northern boundary of the wildlife analysis area.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Common to all Alternatives

The analysis of potential effects on access and forest structure show there would be no change in open roads and no measurable change in vegetation that would affect elk habitat. There would be no change in EHP. There are no foreseeable changes on non-NFS lands at this time.

Alternative A

Continued recreational garnet digging in 281 Gulch would result in the potential loss of a low number of trees and maintain the existing level of disturbance. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable elk habitat or affect elk populations.

Direct and Indirect Effects

Alternatives B and C

As discussed in the previous section on access/disturbance, Forest Service testing, and approval of prospecting permits would constitute a temporary and low level of disturbance. Approval of the lease on Bechtel Butte would also constitute a low level of disturbance over a longer period. Recreational mining at Forest Service sites would maintain the existing level of disturbance. The location of this low level disturbance would change.

The above disturbances would be localized and limited to a relatively small area by topography and forest vegetation. Elk would be able to avoid the disturbance and any effect would be relatively minor and not measurable using the *Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho.*

The potential development of garnet sand mining in the tributary to the W.F. Emerald Creek and in the E.F. Emerald Creek would increase disturbance levels adjacent to existing open roads. This disturbance would be seasonal and occur during periods of active mining (e.g. during working hours). There would also be an increase in traffic levels (approximately 7-10 trucks/day) on segments of existing open roads due to hauling of material. This increase in intensity may alter use by elk of some suitable habitat. However, it would not increase the number of subdrainages with existing disturbance and topographic barriers and forest vegetation would limit the area of impact to a corridor adjacent to stream segment being worked in.

Cumulative Effects

Alternatives B and C

Based on the discussions of potential direct and indirect effects, the proposed action(s) would not appreciably add to existing impacts on elk habitat. Forest Plan standards for EHP would be maintained.

Moose

Moose were identified in the Forest Plan as a MIS associated with mature timber stands. Moose eat a variety of plants with shrubs and trees being the most important winter forage. Components of moose habitat include mature timber for cover, new growth of trees/shrubs for browse, and wetland areas that provide aquatic plants for browse. The level of human disturbance (i.e. human caused mortality) is also one of the habitat component affecting moose in the analysis area.

The analysis done for forest structure and old growth has shown that there would be no significant change in mature timber and upland browse. The analysis for access has shown there would be no change in open roads. Therefore, potential impacts on riparian habitat will be used to measure potential effects on moose.

Existing Condition

The suitability of riparian habitat for moose is being adversely affected by existing open roads and the vegetative conditions. For example, the East Fork of Emerald Creek has an open road in or adjacent to the riparian area for most of its length and the riparian area is relatively open with little forest structure or brush present. This present vegetative condition is a result of the old railroad, past mining, past harvest of trees (e.g. old stumps present) and beaver activity. Moose are known to use the wetlands created during the rehabilitation of past mining activity sites (e.g. near Emerald Creek Campground).

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet digging in 281 Gulch would result in the potential loss of a low number of trees and maintain the existing level of disturbance. This level of impact would be relatively inconsequential at the drainage/subdrainage level and would not measurably affect the availability of suitable moose habitat or affect moose populations.

Direct and Indirect Effects

Alternatives B and C

Existing brush in approximately 6.4 miles of the riparian area adjacent to the E.F. Emerald Creek would be lost within the temporal scope of this analysis. The existing suitability of this habitat is low due to the relatively sparse browse conditions and the open road. The removal of most brush would further reduce its suitability. The additional impacts would not be expected to appreciable add to existing impacts on moose habitat.

Cumulative Effects

Alternatives B and C

The potential development of garnet sand mining in the E.F. Emerald Creek would add to existing adverse cumulative effects. However, The proposed action(s) would not adversely impact moose populations in the analysis area. Forest Plan standards would be maintained.

Threatened and Endangered Wildlife Species

The U. S. Fish and Wildlife Service (USFWS) identified five listed wildlife species that may occur on the Idaho Panhandle National Forests (Species list # 1-9-01-SP-613): Bald Eagle, Gray Wolf, Grizzly Bear, Woodland Caribou and Canada Lynx.

Based on direction provided by the USFWS, the Species List, review of the area, a search of district records, scientific literature, professional knowledge of the area, the EAWS, and a review of information from the Conservation Data Center (CDC) species requiring analysis were identified. See the Species Relevancy Screen and Rationale for no Further Analysis sections for additional discussion regarding analysis needs of listed species in the wildlife analysis area.

Table 3-26 provides a short synopsis of the listed species, their habitat, and the existing condition within the wildlife analysis area.

Table 3-26 - Listed Wildlife Species

Common Name	Habitat	Existing Condition in the Wildlife Analysis Area
Bald Eagle	Nest near large bodies of water in areas relatively free from disturbance. Perch sites, roost sites and access to prey are essential components of winter habitat.	No large bodies of water are present and availability of prey is low. There are no nests known or suspected. District records indicate occasional sightings.
Canada Lynx	Mesic conifer forests that provide a prey base of snowshoe hare (generally above 4,000'). Late and early successional stages.	Based on elevation, forest type, and potential vegetation (habitat type) the WL analysis contains insufficient capable habitat to support the species and is not in a Lynx Analysis Unit.

Common Name	Habitat	Existing Condition in the Wildlife Analysis Area
Gray Wolf	Large areas with high prey densities and isolation from human activities. Availability of den and rendezvous sites.	There is no evidence of den or rendezvous sites. Based on its location relative to surrounding human disturbances habitat is considered low to moderate quality.
Grizzly Bear	Large areas of undisturbed habitat. Low elevation riparian areas, meadows, snow chutes, shrubfields, grasslands, and open timbered stands,	In the Experimental Population Area of Bitterroot Ecosystem. No documentation of grizzly bears in the Bitterroot Ecosystem. No known or suspected suitable habitat in analysis area.
Woodland Caribou	Mature to old growth forests with dense canopies over a large elevation gradient. High elevation timbered ridges with abundant lichens.	The project area is outside of the woodland caribou recovery area. The species is not known or suspected on the St. Joe Ranger District.

The grizzly bear and woodland caribou are not present in the project area. However, the project area is in the Experimental Population Area of the Bitterroot Ecosystem (USDI, 2000). If grizzly bears are reintroduced into the Bitterroot Grizzly Bear Recovery Area the Record of Decision (ROD) on Grizzly Bear Recovery in the Bitterroot Ecosystem provides provisions for management of bears that move onto public land in the Experimental Population Area (USDI, 2000). The USFWS does not envision conflicts with any current or anticipated management actions of the U.S. Forest Service (USDI, 2000). Based on the species not being present, the existing condition of habitat (i.e. low elevation, lack of remoteness), the nature of the proposed activities, the uncertainty of when/if bears may occur in the project area, and the time frames of the decision to be made and any reintroduction effort, there would be no effect on grizzly bear. There would be no effect on grizzly bear or woodland caribou and no further discussion for those species is needed.

The wildlife analysis area was not included in any Lynx Analysis Unit on the district and is not considered capable of providing sufficient habitat for resident lynx. The project (and analysis) is consistent with direction in the Canada Lynx Conservation Assessment and Strategy. There would be no effect on this species and no further analysis is needed or required.

Bald Eagles

Bald Eagles occupy riparian or lacustrine habitat almost exclusively during the breeding season (USDI, 1994). They select isolated shoreline areas with larger trees to pursue such activities as nesting, feeding, and loafing. Components of nesting habitat include proximity to sufficient food supply, the presence of dominant trees, and line-of-sight to a large body of water (often within 0.25 mile of water). Nest sites are commonly distributed around bodies of water ≥80 acres or major rivers.

A site specific list of Listed species from the U.S. Fish and Wildlife Service for Emerald Resource Unit EIS did not include bald eagles (USFWS, 1992). However, because of sightings in the E.F. of Emerald Cr. and the potential impacts on riparian habitat the bald

eagle will be analyzed further. Impacts on riparian habitat will be used to measure potential impacts on bald eagles.

Existing Condition

Occasional sightings of bald eagle have been recorded in the lower St. Maries River. District sighting information indicates very limited use during winter and the area is not considered bald eagle wintering habitat. There are no bald eagle nests in the St. Maries drainage (this includes the analysis area). Based on the above information, bald eagle occurrence in the analysis area is considered incidental.

There are no large bodies of water in the project area. The general quality/suitability of bald eagle nesting habitat in the analysis area is unknown. However, based on existing disturbance factors (e.g. distance to open road), the limited occurrence, the size of the East Fork of Emerald Cr. and the prey base, the quality is considered low at best (USDI, 1994). Based on the lack of capable/suitable habitat the potential for effects on bald eagle habitat is low.

Of the 59.7 miles of riparian habitat used to indicate potential impacts in this analysis, approximately 17.6 miles have some evidence of past impacts. See the riparian habitat section for a more complete discussion of the existing condition of the riparian habitat.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet mining in 281 Gulch would occur outside of areas likely to be used by bald eagles and would therefore not effect bald eagles or their habitat. There would be no management-initiated change in bald eagle habitat or use.

Direct and Indirect Effects

Alternatives B and C

Forest Service testing, recreational mining at Forest Service sites, approval of prospecting permits, approval of the lease on Bechtel Butte, and garnet sand mining in the tributary to the W.F. Emerald Creek would occur outside of areas likely to be used by bald eagles and would therefore not effect bald eagles or their habitat.

The potential development of garnet sand mining in the E.F. Emerald Creek would occur in riparian habitat and areas where bald eagles have been sighted. This activity may alter incidental occurrences of bald eagles but would have no effect on any nesting eagles or populations.

Cumulative Effects

Alternatives B and C

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on bald eagles other than the low potential for alteration of the existing incidental use. Forest Plan standards would be maintained.

Gray Wolf

Historically wolves were distributed throughout most of Idaho in unknown populations. Wolf packs of 4 to 10 animals appear to have ranged widely in the mountains of northern and central Idaho. A decline of native ungulates, control programs designed to eradicate wolves and conflicts with livestock and humans caused the decline of wolf populations in Idaho and led to the absence of a breeding population in Idaho (Hansen, 1986).

The Stars and Sands wildlife analysis area falls within the Central Idaho reintroduction area where gray wolves are classified as nonessential experimental populations. This classification treats wolves as proposed for listing under the ESA (i.e. instead of endangered). The reintroduction of wolves in Central Idaho did not envision conflicts with current or anticipated management actions. No changes in land use restrictions (other than the possibility of temporary restrictions near den sites) are required because of the reintroduction.

High prey densities -particularly big game - and minimal conflict with human interests and uses characterize wolf habitat. Human disturbance as measured by open road densities will be used to disclose potential effects in this analysis. Other important habitat features for wolves include den and rendezvous sites (Hansen, 1986).

Existing biophysical habitat does not preclude the presence of wolves in the drainage. However current road densities, human presence, and existing land uses limit the likelihood of wolves occurring in the area.

Existing Condition

There are no known wolf dens or rendezvous sites in the wildlife analysis area or the St. Maries drainage. Existing total road density in the wildlife analysis area is 3.7 mi/mi^2 and open road density is 1.5 mi/mi^2.

Potential elk use is a measure of prey availability (see the previous section on elk in this document). The potential elk use value (EHP) in the Emerald evaluation area is approximately .46, the Cedar Creek elk evaluation area EHP is .47, and in the Hidden Creek elk evaluation area it is .43.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

Continued recreational garnet mining in 281 Gulch would not affect road densities or prey availability. Maintaining the existing disturbance levels (see access/disturbance analysis) would not impact wolves or the existing low quality habitat. There would be no management-initiated change in wolf habitat or use.

Direct and Indirect Effects

Alternatives B and C

Based on the analysis for access and elk/moose, there would be no effect on road densities or prey availability. It is unlikely that the changes in disturbance levels (see access/disturbance analysis) would impact wolves or the existing low quality habitat.

Cumulative Effects

Alternatives B and C

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on wolves. However, anticipated management of the non-NFS lands in the surrounding landscape (primarily high road densities) are expected to maintain the majority of the St. Maries River drainage in a condition with a low likelihood of providing moderate to high quality habitat for wolves.

Forest Plan standards would be maintained.

Sensitive Wildlife Species

Sensitive species are determined by the Regional Forester (FSM 2670.5) and are those species for which population viability is a concern. The National Forest Management Act directs the Forest Service to review programs and activities to ensure that species do not become threatened or endangered as a result of Forest Service actions. The ICB Assessment found that species that are likely in decline (includes many Sensitive species) are associated with landscape and habitat components that are declining. Forest Plan direction for the Idaho Panhandle National Forests (IPNF) states that habitat of sensitive species will be managed to prevent further declines in populations to prevent federal listing.

There are few quantitative models available which are appropriate for assessing potential effects on sensitive species. This analysis identified capable and suitable habitat based on the latest scientific literature for each species and available data in the TSMRS database. The analysis may identify habitat that is not used and wildlife may use habitat not identified.

Impacts on acres of suitable habitat will be measured by alternative and discussed for each species as appropriate.

Sensitive species on the Regional Foresters list were screened for their relevancy to the wildlife analysis area and the proposed action. See the Species Relevancy Screen and Rationale for no Further Analysis sections of this document for additional discussions regarding analysis needs of sensitive species. Further information can also be found in the project file.

Based on species occurrence, habitat capability and suitability, and the likelihood or risk of potential impacts on habitat and the species, there would be no impact on species identified in the Species Relevancy process as needing no further analysis.

Table y displays sensitive wildlife species from the U.S. Forest Service Region One list that may be impacted by the proposed action and/or alternatives, a short description of habitat requirements, and comments regarding habitat capability/suitability.

A more detailed analysis for each species follows the table.

Table 3-27 - Sensitive Wildlife Species and Habitats

Common Name	Habitat	Comments
Fisher/Marten	Mature and old growth forests (riparian linkages).	Suitable habitat available within wildlife analysis area. Fisher and marten occupy similar habitat.
Wolverine	Areas of adequate food supply in large remote areas.	Limited capable or suitable habitat in wildlife analysis area.
Northern Goshawk	Nest stands - mature to old growth forests	Suitable habitat in wildlife analysis area.
Black-backed woodpecker	Conifer forests, dead/dying trees (especially fire killed).	Suitable habitat in wildlife analysis area.
Flammulated owl	Mature to old growth Douglas-fir and ponderosa pine forests.	Limited capable or suitable habitat within wildlife analysis area.
Coeur d'Alene Salamander	Fractured rock, seeps, waterfall spray zones, and streamsides.	Limited capable or suitable habitat in wildlife analysis area.
Boreal toad	Breed in lakes, ponds, streams and persistent water sources.	Potential habitat present in wildlife analysis area.
Northern leopard frog	Vegetated wet meadows and marshes. Breeding habitat = lakes, ponds, springs.	The wildlife analysis area is outside of predicted range in Idaho. However, potentially suitable habitat is present.

Fisher (and Marten)

Fisher and marten occupy similar habitat (Ruggiero et. al., 1994) and potential impacts will be analyzed for both species using the same methodology (the marten is a MIS and not a sensitive species but will be addressed in this section of the document).

Fisher are considered rare through most of Idaho. They prefer late seral stage coniferous and mixed forest habitat. Fisher utilize forest riparian habitats as resting sites and use them extensively for travel. Fisher appear to avoid high elevations (> 4,000 ft.) and non-forested areas (Ruggiero, et. al. 1994). Extensive alteration of forest structure such as reductions in canopy closure, snags, and down woody material (e.g. from fire or timber harvest) may reduce its habitat value for fisher (Draft - Forest Carnivores in Idaho HCA/S, 1995).

Marten associate closely with late-successional stands of mesic conifers (Ruggiero et. al., 1994). In the western United States martens are most abundant in mesic mature to over mature spruce-fir forests where small mammal prey species are most abundant (USDA, 1990). In general, marten prefer forest stands with greater than 40 percent tree canopy closure; and large down logs, stumps, and snags which provide access to prey under the snow and denning sites. Use or selection of riparian zones by marten has been reported in the literature (Ruggiero et. al., 1994).

Methodology

To conduct the analysis, assess potential effects and compare alternatives, the analysis uses management guidelines from *Fisher Biology and Management in the Western United States* (Heinemeyer and Jones, 1994) and *DRAFT, Forest Carnivores in Idaho*, (IDFandG, 1995). The percent of the area in mature/old forest structure (i.e. suitable habitat) will be displayed for each alternative and compared to the guidelines. Changes from the existing condition will be displayed and discussed relative to guidelines for forest structure.

The goal at the scale of this analysis (i.e. the Stars and Sands wildlife analysis area or "subdrainage") is to maintain functional home ranges (Heinemeyer and Jones, 1994) and a spatial distribution of multiple home ranges that maintain population viability (IDFandG, 1995). However, there are many elements (such as the percentage of private lands and the amount of agricultural lands) that conflict with and limit the "suitability" of fisher/marten habitat in the surrounding landscape and St. Maries River drainage. If the NFS lands were to be managed to meet objectives for high quality subdrainages, it is debatable whether the surrounding subdrainages could/would be managed to provide multiple home ranges that would contribute to population viability. The resolution of this situation is beyond the scope of a project level analysis.

Forest carnivore conservation/management requires an ecosystem management approach at a scale larger than the Stars and Sands wildlife analysis area, the St. Maries River drainage, the St. Joe River drainage or the IPNF. There is no existing management strategy at a Regional, State, or Forest level. It is therefore difficult to put the habitat in the St. Maries drainage and Stars and Sands wildlife analysis area into a landscape perspective. However, current literature (including existing draft assessments and strategies) can be used to identify capable and suitable habitat, establish existing conditions and display/discus potential effects on suitable habitat.

While trapping is a parameter affecting habitat for forest carnivores, the Forest Service has no jurisdiction concerning trapping; and it is beyond the scope of this project analysis. However, road densities affect vulnerability (to trapping) and will be addressed.

Existing Condition

Vegetation/Habitat

Late successional habitat is an essential component of forest carnivore habitat. The physical structure of the forest appears to be more important for fisher and marten than the species composition.

Habitat management considerations for fisher and marten emphasize maintaining late successional forest habitat. Mature riparian forest is especially important for denning sites and travel ways. Based on habitat requirements, the quality, amount and distribution of late successional forest habitat within the drainage is considered the most important factor for fisher and marten.

On NFS land in the Stars and Sands wildlife analysis area there are 16,926 acres of the appropriate habitat types (i.e. potential vegetation) identifiable as capable fisher/marten habitat and 615 acres with no data to determine capability. Based on the predominance of capable habitat types the 615 acres with no data will be considered capable. This results in 17,541 acres of capable fisher/marten habitat.

The existing condition of forested habitat on NFS lands in the Stars and Sands wildlife analysis area and the guidelines for forest structure by subdrainage are displayed in Table 3-28.

Table 3-28 - Existing Condition and Guidelines for Forest Structure

			Subdrainage Guidelines		
Forest Structure	**Existing Condition***		**High Quality**	**Moderate Quality**	**Low Quality**
Mature/older forest	3,680	21%	65-75%	≥40%	30-40%
Young forest**	9,985	57%	10-25%	na***	na
Pole/sapling	2,118	12%	10-25%	na	na
Open/seed	1,522	9%	na	na	na

* % of NFS capable habitat in the wildlife analysis area

** includes multistory stands

*** not applicable – no guidelines identified

In addition to the 3,680 acres of mature and older suitable habitat, there are an additional 6,401 acres identified as young/immature forest stands that have a substantial number of large trees (20/acre at least 14 inches dbh). These stands may also provide suitable fisher/marten habitat. Based on these figures, there may be as much as 10,175 acres (58% of NFS capable habitat) of suitable fisher/marten habitat in the wildlife analysis area.

However, it is also probable that these figures over estimate suitable habitat because stand specific data on snags and down logs is not available.

Based on the amount of mature and older forest structure, the existing condition of the Stars and Sands wildlife analysis area is below the criteria needed for a low quality subdrainage. This is due primarily to the fire history (and historic logging) that results in the majority of the stands being classified as immature. However, when all stands with more that 20 trees per acres at least 14 inches dbh are considered, the existing condition would meet the criteria of a moderate quality subdrainage.

The above discussion applies only to the NFS administered lands in the wildlife analysis area. It should be noted that the surrounding landscape is primarily non-NFS land that does not provide much, if any mature or older forest habitat.

Impacted riparian zones are also affecting fisher habitat. Open riparian areas greater than 300' in width have been identified (e.g. near the Emerald Creek Campground). See the previous section on riparian habitat for further discussion on effects on riparian habitat.

Access/Vulnerability Risk

Trapping-vulnerability risk has been cited as one of the factors affecting forest carnivores in Idaho (IDFG, 1995). Roads are correlated with trapping-vulnerability and human disturbance. Areas with greater than or equal to 1 mi/mi2 road densities have a high risk to trapping vulnerability for fisher and marten.

In the Stars and Sands wildlife analysis area there is a total road density of 3.7 mi/mi^2. There are approximately 46.5 miles of open road that results in an open road density of 1.5 mi/mi^2. This constitutes a high risk to trapping vulnerability.

Environmental Consequences

Direct and Indirect Effects

Common to all Alternatives

The analysis of potential impacts on forest structure shows a negligible change in the amount of mature/old forest structure. The small changes in forest structure would not result in a meaningful change in the percent of mature fisher/marten habitat in the wildlife analysis area.

The analysis of access done under terrestrial habitat in this document reveals that there would be no change in road densities. Therefore, there would be no change in trapping – vulnerability risk.

Cumulative Effects

Common to all Alternatives

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on fisher or marten. However, anticipated management of the non-NFS lands in the surrounding landscape are expected to maintain the adjacent subdrainages in a condition with a low likelihood of providing sufficient suitable habitat to provide a spatial arrangement of multiple home ranges.

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on trapping-vulnerability of fisher or marten. However, anticipated management of the non-NFS lands in the surrounding landscape are expected to maintain road densities at a level that constitutes a high risk to trapping-vulnerability.

Wolverine

Wolverines are low density, wide-ranging species that inhabit remote forested areas, ranging over a variety of habitats. Home ranges of resident female wolverines range from 11.6 mi^2 to over 300 mi^2 in Montana and Idaho. Wolverines tend to use lower elevations in the winter and higher elevations in summer, when these areas provide the greatest potential food supply (Hornocker and Hash 1981). The availability of large mammal (i.e. ungulate) carrion as food is important for the distribution, survival, and reproductive success of wolverines (Ruggiero et. al., 1994). Wolverines appear to be tied to low human occurrence; especially undisturbed seclusion for reproducing females (Copeland, 1995)

Factors with the potential to threaten local population viability of the species include reduction of "wilderness refugia" or natural reserves (i.e. large areas of habitat with limited human access) and food availability (Butts, 1992).

Management objectives for wolverine at the drainage level primarily involve maintaining quality habitat by managing road systems to limit disturbance and reduce risk of displacement during critical wolverine denning periods (IDFG, 1995).

Existing Condition

Wolverine tracks have been reported in the wildlife analysis area. The sighting(s) most likely represent a transient individual. In a district wide assessment, potential wolverine natal denning habitat was not identified in or adjacent to the wildlife analysis area. In the Stars and Sands wildlife analysis area there is a total road density of 3.7 mi/mi^2. There are approximately 46.5 miles of open road that results in an open road density of 1.5 mi/mi^2.

The territory size requirements, lack of denning habitat, and existing access in the wildlife analysis area and surrounding drainages preclude the likelihood of other than incidental occurrence within the wildlife analysis area.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

The analysis of access done under terrestrial habitat in this section of the document reveals that there would be no change in road densities. This along with the absence of denning habitat means there would be no change in wolverine habitat.

Cumulative Effects

Common to All Alternatives

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any effect on wolverine habitat. However, anticipated management of the non-NFS lands in the surrounding landscape are expected to maintain road densities at a level that limits the suitability of the area as wolverine habitat.

Northern Goshawk

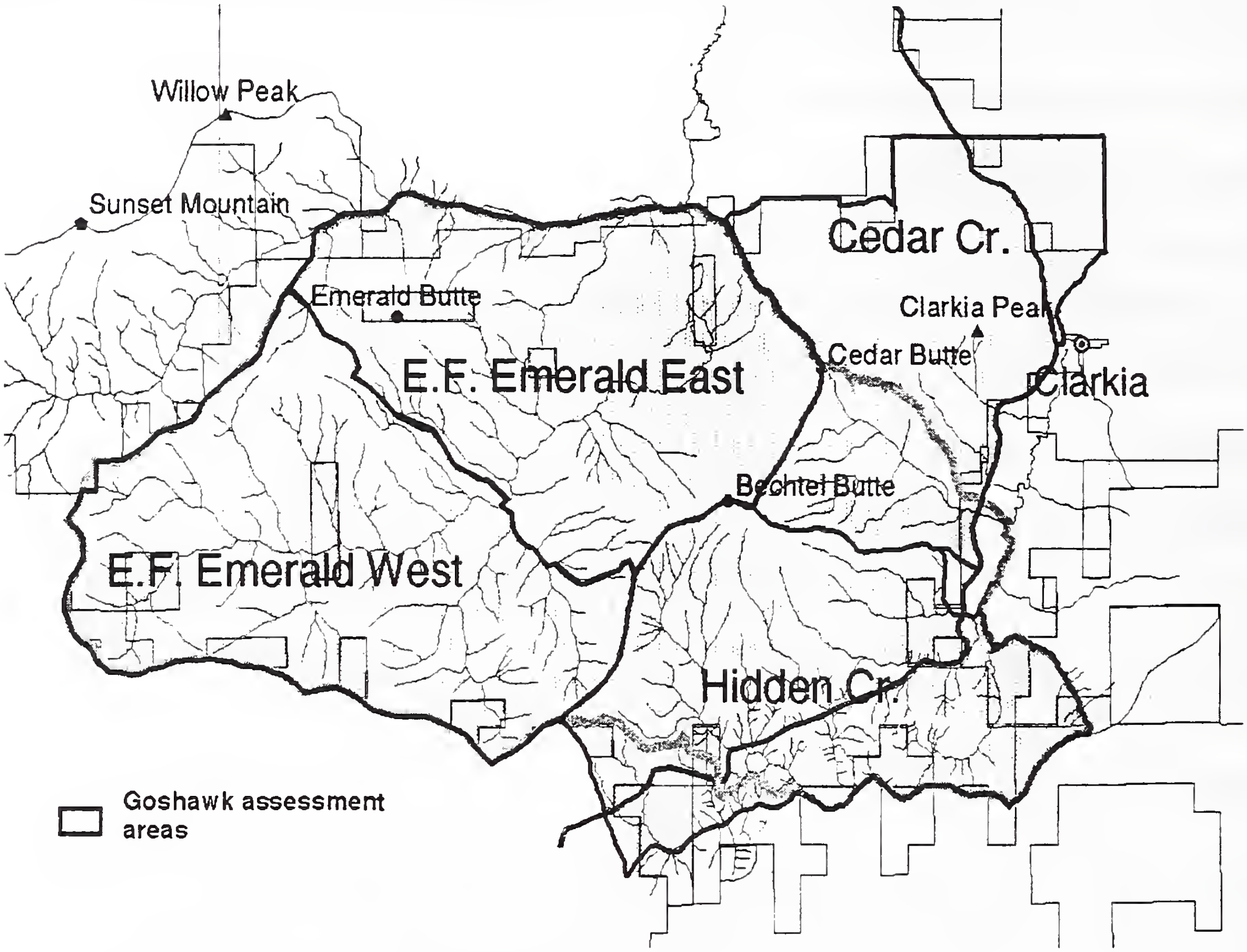
Goshawks use a variety of forest types, structures, and successional stages, but are primarily associated with late successional habitat. For nesting, goshawks utilize mature to old growth stands on gentle to moderately steep slopes. Forest habitat, pole stage or larger, which is open enough to allow unimpeded flight through the understory (less than 750 trees/acre larger than three inches dbh) is considered suitable for foraging.

The analysis of effects on goshawks uses direction in “Old-Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains” (USDA, 1990) and “Management Recommendations for the Northern Goshawk in the Southwestern United States” (Reynolds et. al. 1992) to determine potential effects. The analysis is tiered to the analysis done for size class and old growth.

Geographic Scope

Goshawk home ranges are approximately 5,000 to 6,000 acres and are recommended for evaluation of potential goshawk suitability (USDA, 1990 and Reynolds, 1992). For this analysis 4 assessment areas that encompass the WL analysis area were delineated based on topographic features, ownership, and existing information (i.e. data from the Hidden Cedar project). These assessment areas represent hypothetical goshawk home ranges.

Figure 3-7 – Goshawk Assessment Areas



Management recommendations for each home range include approximately 3 suitable nest areas and 3 replacement areas (in a developmental phase) per home range and a mosaic of vegetation structural stages in both an approximately 420-acre Post-fledging Family Area (PFA) and a 5400-acre foraging area.

Existing Condition

Based on literature descriptions and field verification of habitat, there is capable and suitable habitat available within the Stars and Sands project area. Goshawks are occasionally sighted within the wildlife analysis area and surveys in the analysis area have confirmed the occurrence and nesting of goshawks. One known nest in the Stars and Sands wildlife analysis area has been located.

Table 3-29 displays the existing conditions in each of the goshawk assessment areas/home ranges and the desired percent of each vegetation structure.

Table 3-29 - Existing Condition for Goshawk Assessment Areas/Home Ranges

	Forage Area Vegetation Structure									
	Existing acres/%						Desired %			
Assessment Area	**acres**	**pot. nest areas***	**grass/ shrub**	**seed/ sap**	**pole**	**mid/ old**	**grass/ shrub**	**seed/ sap**	**pole**	**mid/ old**
Cedar Cr.	5,273	20+	348 7%	464 9%	461 9%	4000 76%	10%	10%	20%	60%
Hidden Cr.	5,739	20+	297 5%	618 11%	539 9%	4283 75%				
E.F. Emerald East	5,802	20+	118 2%	795 14%	98 2%	4791 83%				
E.F. Emerald West	6,251	20+	0 0%	1378 22%	213 3%	4660 75%				

*The exact number of potential nest areas depends on how patches of at least 30 acres in size are counted. These values represent a minimum number based on a conservative approach when assessing nest areas.

Nest areas include mature/old forest structure and stands classed as immature but that have sufficient trees per acre greater than 14"dbh (20/acre).

Based on TSMRS data the amount of seedling/sapling forest in the Hidden Creek, E.F. Emerald East, and E.F. Emerald West goshawk assessment areas is above the recommended 10%. Each assessment area has above the desired level of mid-aged to old forest structure.

Environmental Consequences

Direct and Indirect Effects

Common to All Alternatives

There would be no meaningful change in the mosaic of vegetative structure in the wildlife analysis area. The small changes in forest structure displayed in the terrestrial habitat section for alternatives B and C would not result in a meaningful change in the percent of mid/old vegetative structure (already above desired levels) in any goshawk assessment area.

Cumulative Effects

Common to all Alternatives

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would appreciably affect the availability of suitable habitat or lead to any further effect on goshawks.

Black-backed Woodpecker

Black-backed woodpeckers are specialists in forests that have insect outbreaks from either wildfire or other reasons. They nest in snags or in live trees with heart rot, which are at least 5 inches in diameter. Black-backed woodpeckers feed primarily on wood-boring beetles and specialize on large areas of recently killed, beetle-infested timber. Breeding densities of black-backed woodpeckers vary considerably in response to prey availability. They are specialists in exploiting recent forest fires, especially for the first 3 to 5 years after burning, and rapidly utilize new burns (Hutto, 1995). Historically, mixed severity and stand replacing fires produced new habitat annually - in greater amounts than is presently produced under a fire suppression strategy.

There have been black-backed woodpecker surveys in the St. Maries River drainage and their presence has been confirmed. Based on literature descriptions and field verification of habitat, there is capable and suitable habitat available within the Stars and Sands Project Area. Distribution of black-backed woodpeckers is presumed to coincide with existing stands of immature to mature old forest structure. They are suspected of occurring at levels comparable with other areas on the Forest and District.

Existing Condition

Black-backed woodpeckers prefer mature and old growth forests and fire or insect damaged stands. The wildlife analysis area contains 3,680 acres of mature and/or old forest that is considered high quality habitat and an additional 9,758 acres of immature (and multistoried) stands considered suitable habitat.

Due to the fire history and past logging in the drainage there is a relatively low level of mature/old forest structure in the St. Maries River drainage; and current fire suppression policy is not conducive to the creation of areas of fire-killed trees. Both of these conditions may be affecting populations of black-backed woodpeckers.

Environmental Consequences

Direct and Indirect Effects

Common to all Alternatives

There would be no meaningful change in the percent of suitable black-backed woodpecker habitat in the wildlife analysis area. The analysis of potential impacts on forest structure shows a negligible change in the amount of mature/old forest structure in each action alternative. In addition the analysis for cavity habitat reveals minimal impacts on cavity habitat.

Cumulative Effects

Common to all Alternatives

There would be no adverse effects from the proposed action(s) that when added to past, present and reasonably foreseeable actions would lead to any substantive effect on black-backed woodpecker habitat. However, continuation of the present fire suppression policy on all lands in the wildlife analysis area and surrounding landscape would continue to limit the availability of highly suitable/preferred habitat.

Flammulated Owl

Flammulated owls are seasonal migrants that occupy home ranges in the northern latitudes during the spring, summer and fall. They are cavity nesters that depend upon naturally occurring or excavated cavities for nesting. Consequently, snags and other defective trees are an important component of their breeding habitat.

These owls are attracted to relatively open, older forests featuring ponderosa pine and Douglas-fir that are correlated with drier habitats. Reynolds and Linkhart (1992) reported that all published North American records of nesting, except one, came from forests in which ponderosa pine was at least present, if not dominant. The flammulated owl's preference for ponderosa pine and/or Douglas-fir can also be linked to prey availability (primarily moths, beetles, crickets). Reynolds and Linkhart noted a stronger correlation between prey availability and ponderosa pine and Douglas-fir, than with other common western conifers.

Existing Condition

Based on potential vegetation (i.e. vegetation habitat types), there are 176 acres of capable flammulated owl habitat in the wildlife analysis area. There is no suitable habitat at this time. Capable stands are forested by unsuitable cover types (e.g. white pine, grand-fir).

There are no reported occurrences of flammulated owls in the Stars and Sands wildlife analysis area. The fire history in the drainage has resulted in a low level of mature/old forest structure in the drainage; and current fire suppression policy is not conducive to the creation and maintenance of areas of more open-grown stands of ponderosa pine. At best, the area provides only marginal habitat for this species. The species is considered not present to relatively uncommon in the St. Maries drainage compared to other areas on the St. Joe District.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Common to all Alternatives

There would be no activity on the few acres of capable flammulated owl habitat in the analysis area and therefore no effect on flammulated owls.

Coeur d'Alene Salamander

Coeur d'Alene salamanders are restricted to cool damp aquatic habitats that have thermal and hydric stability. The species has been found in three major types of habitats in northern Idaho: spring seeps, waterfall spray zones and along stream edges between 1,800 to 3,500 feet elevation. Known populations occur in association with sharply fractured rock formations in conjunction with both persistent and intermittent surface water (Cassirer et.al., 1994). These conditions are critical for Coeur d'Alene salamanders since they respire through the skin and lose water to the environment through evaporation (Groves 1989).

Existing Condition

There are no known salamander sites in the Stars and Sands wildlife analysis area. Limited potentially suitable microhabitat occurs in the analysis area. However, repeated surveys have failed to document the presence of Coeur d'Alene salamanders (USDA, 1993). Wilson (1992) cites the E.F. Emerald Creek and its tributaries from Hodo summit to Garnet Gulch as an area that may contain suitable habitat and suggests additional surveys. Subsequent data collection narrowed potential habitat to 3 sites in Highline Creek, Strom Gulch, and Flat Creek (USDA, 1993). Observations of the affected riparian areas during field reviews have not noted potential habitat. The E.F. Emerald Creek drainage has not been identified as critical to the long term persistence of Coeur d'Alene salamanders (IDFG et. al. 1994)

In general, the geology of the wildlife analysis area (see the Minerals and Geology section) is not conducive to microhabitat for Coeur d'Alene salamanders (e.g. very little fractured rock associated with springs/seeps and stream sides). The occurrence of the garnet resource and potential salamander habitat has not been observed to coincide.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

281 Gulch was not identified as a drainage containing suitable habitat for Coeur d'Alene salamanders. Filed review and surveys in the drainage have not noted suitable habitat or found the species. Based on the lack of evidence of either suitable habitat or species

presence continued recreational garnet mining in 281 Gulch would not effect Coeur d'Alene salamander habitat or populations.

Direct and Indirect Effects

Alternatives B and C

There would be no impacts on Coeur d'Alene salamanders from the lease application on Bechtel Butte, the prospecting permit on Bechtel Butte, Forest Service testing, or the prospecting permits in Cat Spur Creek, Hidden Creek, Bechtel Creek, and the E.F. Emerald Creek.

The extent and intensity of activity associated with recreational garnet mining and the potential development of garnet sand mining makes it likely that any microhabitat in areas scheduled for those activities would be adversely impacted to some degree (e.g. from complete obliteration to alteration of water flow). Therefore the likelihood of effects on Coeur d'Alene salamanders from these activities is primarily correlated with the likelihood of their presence/absence.

None of the 3 potentially suitable microhabitat sites would be impacted by the proposed action(s). The likelihood of Coeur d'Alene salamander presence in the project area is very low. This is based on the lack of known presence in the E.F. Emerald Creek drainage despite numerous surveys and also the limited amount of suitable habitat. Given the low likelihood of presence (based on lack of evidence and geology), and the nature of garnet occurrence it is unlikely that the proposed action(s) would affect Coeur d'Alene salamanders or their habitat. Furthermore, if salamanders should be present the low likelihood of corresponding occurrence of garnets and salamander habitat limits the potential for direct disturbance of habitat and indirect effects from changes in water flow and increased sediment.

The risk of adverse impacts to Coeur d'Alene salamanders and/or their habitat is very low. Based on this low risk, the relative abundance of sites elsewhere on the district and within its range, and the relatively low importance of the E.F. Emerald Creek to the persistence of the Coeur d'Alene salamander the proposed actions may impact individuals and/or populations but would not adversely affect population viability of the species.

Boreal Toad

Boreal toad breeding habitat includes shallow, quiet water in lakes, marshes, bogs, ponds, wet meadows, and other persistent water sources. Young toads are restricted in distribution and movement by available moist habitat, while adults can move several miles and reside in marshes, wet meadows, or forested areas. Toads hibernate in the winter in habitats that maintain a high humidity and above-freezing temperatures. Areas that provide shelter for hibernating toads include rodent burrows, beaver dams and slash piles (Loeffler, 1998).

Reasons for the decline of the boreal toad have not been defined with any degree of certainty. However, habitat alterations from timber harvest, grazing, recreation, and water

development would likely not be beneficial to long-term enhancement of boreal toad habitats (Loeffler, 1998). One hypothesis explaining the boreal toad decline concerns mortality caused by disease or some other widespread agent. However, none of these factors have been shown as causative agents for population declines. Since this species depends on wetlands to breed, the reduction of or adverse impacts on wetlands potentially have detrimental effects on boreal toads.

It is important that toads be able to move among their seasonal habitats. The biggest potential barriers to their movement are roads. Steep roadcuts can be a barrier to toads moving between seasonal habitats. Juvenile toads are vulnerable to being killed by motorized vehicles when they are dispersing from their natal ponds.

Existing Condition

Boreal toads have been found at various locations in the analysis area, in both riparian and upland habitats. They have been found at the Shorty's dig site near the Emerald Cr. campground, at and near the garnet digging site in 281 Gulch and on an old road near Cedar Butte.

Based on habitat needs as described in the literature, the mesic nature of much of the forests of the IPNF indicate that toads have many opportunities to find persistent small water sources for breeding, and could successfully disperse through moist forest.

Environmental Consequences

Direct and Indirect Effects

Alternative A

The continuation of recreational mining for garnets in 281 Gulch would impact riparian habitat. Based on the confirmed presence of boreal toads alteration of habitat would likely impact potential breeding habitat for the boreal toad. It is also likely that there would be some unavoidable direct mortality of individuals. However, this impact has not been shown to eliminate boreal toads from the drainage. Boreal toads have been seen in the small water filled depressions that result from garnet digging, in the settling ponds used to reduce sediment at the existing site and at a rehabilitated commercial mining site.

Based on their continued existence at impacted sites and the availability of habitat throughout the Emerald Creek drainage, the impacts to riparian habitat are not expected to affect the population viability of boreal toads.

Alternatives B and C

The potential for minor inconsequential impacts on boreal toads from the lease application on Bechtel Butte, the prospecting permit on Bechtel Butte, Forest Service testing, or the prospecting permits in Cat Spur Creek, Hidden Creek, Bechtel Creek, and the Little E.F. Emerald Creek.

The potential development of garnet sand mining and Forest Service recreational mining of garnets would impact riparian habitat. Based on the confirmed presence of boreal toads alteration of habitat would likely impact potential breeding habitat for the boreal toad. However, this impact has not been shown to eliminate boreal toads from impacted drainages (e.g. in 281 Gulch). Boreal toads have been seen in the small water filled depressions that result from garnet digging, in the settling ponds used to reduce sediment at the existing site and at a rehabilitated commercial mining site. It is also likely that there would be some unavoidable direct mortality of individuals.

Design features have been included that are intended to provide undisturbed habitat and a possible refuge. The fact that adult toads commonly use upland habitats also provides an avenue of escape from direct mortality.

Based on their continued existence at impacted sites and the availability of habitat throughout the Emerald Creek drainage, the impacts to riparian habitat are not expected to affect the population viability of boreal toads.

Cumulative Effects

Common to All Alternatives

The proposed actions(s) would contribute to additional disturbance of boreal toads and their habitat. However, because of the continued presence at past disturbed (and rehabilitated) sites, it is unlikely that past, present and reasonably foreseeable future actions would contribute to a trend towards federal listing or cause a loss of viability to the population.

Northern Leopard Frogs

Northern Leopard Frogs are found in or near water in non-forest habitats. They prefer densely vegetated areas such as wet sedge meadows or cattail marshes. Breeding takes place in lakes, ponds, or springs.

Likely factors contributing to its decline nationally include the loss of breeding habitat (e.g. draining of wetlands) and the possible influence of broadscale environmental contaminants.

Existing Condition

The wildlife analysis area is well outside of the predicted range for northern leopard frogs in Idaho (Digital Atlas of Idaho). However, there appears to be potentially suitable habitat in the analysis area (e.g. ponds created during rehabilitation of "Shorty's Dig" area). Surveys for amphibians and reptiles have not recorded Northern leopard frogs in or adjacent to the wildlife analysis area. The lack of records of occurrence and predicted range indicates that this species is unlikely to occur at all and so would be unlikely to be affected by this project. However, the nature and scope of the proposed actions(s) would result in impacts to riparian habitat. Based on field review there is little breeding habitat in the areas that are proposed for mining (i.e. ponds/wetlands with emergent vegetation).

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative A

There would be no management-initiated effects on northern leopard frogs or their habitat.

Alternatives B and C

Based on the project area being outside of the predicted range in Idaho, the lack of evidence of occurrence, and the limited availability of suitable habitat in affected areas there would be no effects expected. Rehabilitation of impacted sites would maintain the level of existing habitat.

Cumulative Effects

Common to All Alternatives

The rehabilitation of past mining sites (e.g. Shorty's dig and near the Emerald Creek Campground) have likely created potentially suitable habitat that did not exist prior to mining. However, because the species has not been found and the area is outside of the predicted range in Idaho, this likely increase in potential habitat has had no effect.

Consistency with Forest Plan and Laws

All alternatives are consistent with applicable goals, direction, standards, and guidelines from the Forest Plan for the management of wildlife habitat and species populations. All alternatives to varying degrees comply with other direction and recommendations regarding management of the various components of wildlife habitat. All alternative comply with applicable Conservation Strategies for wildlife species. All alternatives are consistent with the ESA, NFMA and other laws providing direction and requirements for the management of wildlife species and habitat.

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USDA FOREST SERVICE, Environmental Coordination, Washington, DC

USDA FOREST SERVICE, Region 1 (Missoula, Montana)

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Draft Environmental Impact Statement

Appendix A

September 2001

Recreational dig site in the West Fork of 281 Gulch.

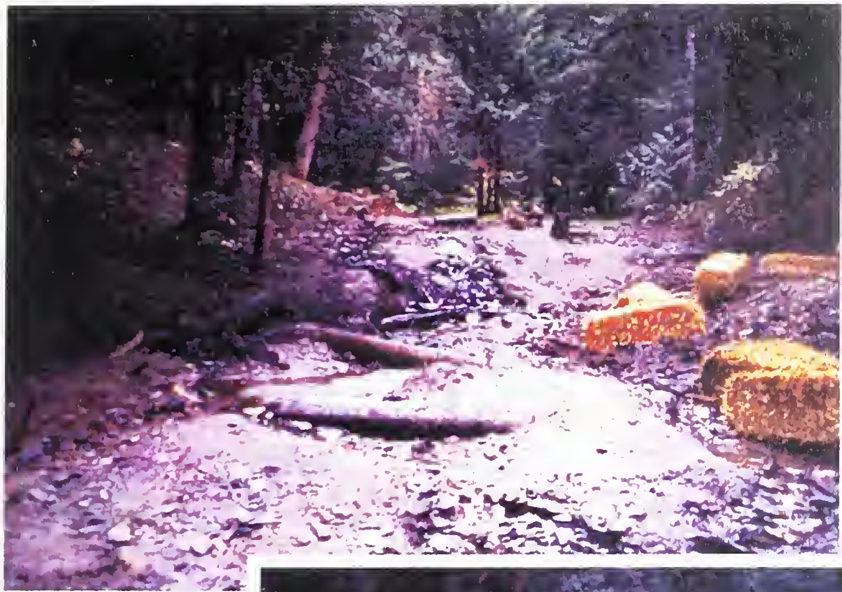
Upper end of West Fork 281 Gulch Dig Site -Reclaimed in 1998.

September 2001

St. Joe Ranger District
Idaho Panhandle National Forests

Recreational garnet diggers getting down and dirty in the East Fork of 281 Gulch.

Garnet diggers show off their day's haul at the Forest Service Public Dig Site "A-Frame" in the West Fork of 281 Gulch.



Reclamation of Public Dig Site in the Upper East Fork 281 Gulch.

Upper end of East Fork 281 Gulch Dig Site -Reclaimed in 1998.

Commercial sand garnet mining in Lower Emerald Creek.

West Fork (above) of Emerald Creek Sand Mining Site - Reclamation including new stream channel construction completed in 1998 and (right) in 1999.

APPENDIX B

APPLICABLE LAWS AND REGULATIONS

MINERALS GENERAL

Mining and Minerals Policy Act of 1970 (84 STAT. 1876; 30 USC 21, a)

This act states: "The Congress declares that it is the continuing policy of the Federal Government in the national interest to foster and encourage private enterprise in (1) the development of economically sound and stable domestic mining, mineral, metal and mineral reclamation industries, (2) the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help assure satisfaction on industrial, security and environmental needs...."

HARDROCK LEASABLE MINERALS ON ACQUIRED LANDS

Mineral Resources on Weeks Law Acquired Lands

The Act of March 4, 1917 (39 Stat. 1150, as supplemented; 16 U.S.C. 520); this act authorizes the Secretary of the Interior to prescribe general regulations to permit prospecting, development, and use of the mineral resources of the lands acquired under the Act of March 1, 1911, known as the Weeks Law, for the best interests of the United States. Generally, leasable hardrock minerals are similar to locatable minerals except they are found on acquired lands. Leasable hardrock minerals include metals and rare earth elements. Uncommon varieties of sand, stone, gravel, pumice, pumicite, cinders, clay, and gem quality garnets are also leasable hardrock minerals when located on acquired lands.

"The Secretary of the Interior is authorized, under general regulations to be prescribed by him, to permit the prospecting, development, and utilization of mineral resources of the lands acquired under the Act of March first, nineteen hundred and eleven (Thirty-sixth Statute, page nine hundred and sixty-one), known as the Weeks Law, upon such terms and for specified periods or otherwise, as he may deem to be for the best interests of the United States; and all moneys received on account of charges, if any made under this Act shall be disposed of as is provided by existing law for the disposition of receipts from national forests."

Reorganization Plan No. 3 of 1946

Part IV, Section 402 (60 Stat. 1097, 1099; 5 USC Appendix 2). This Plan provides that development of mineral deposits in certain lands pursuant to

provisions of the Mineral Resources of Weeks Law Lands Act of March 4, 1917 (Ch. 179, 39 Stat. 1134, 1150, 16 USC 520) shall be authorized by the Secretary of the Interior only when he is advised by the Secretary of Agriculture that such a development will not interfere with the primary purposes for which the land was acquired and only in accordance with such conditions as may be specified by the Secretary of Agriculture in order to protect such purposes.

Hence, the Secretary of Agriculture has either the power to veto mineral development in order to protect resources located on National Forest System lands, or to consent to mineral activity, adding stipulations to protect such lands and resources.

43 CFR 3500 Leasing of Solid Minerals Other Than Coal and Oil Shale and Forest Service Manual 2822 Mineral Licenses, Permits, and Leases Administered By the Department of the Interior

The authorities providing for the leasing of minerals from acquired lands are The Mineral Leasing Act for Acquired Lands of 1947, as amended (30 U.S.C. 351-359) and the Federal Land Policy and Management Act of 1976 (43U.S.C. 1701 *et seq.*). The Mineral Leasing Act for Acquired Lands of 1947 provides for the leasing of minerals other than leasable minerals such as oil, gas. and coal. It requires the consent by the Secretary of Agriculture prior to the leasing of an acquired mineral estate on National Forest System lands. It also allows the Secretary of Agriculture to stipulate under what conditions development can occur under a lease, permit, or license.

MINERAL COLLECTING

43 CFR 3560.7 Hardrock Mineral Specimen Collection

"The surface management agency having jurisdiction over lands shall determine which areas and under what conditions mineral specimens may be collected for non-commercial purposes (e.g., recreation, hobby collecting, scientific or research specimens, etc.), and whether an approved permit shall be required prior to entry on the lands by the collector. If such a permit is necessary, it shall be obtained from the responsible official of the surface management agency who shall have discretionary authority to issue the permit, determine the permit fee, if any, and specify the terms and conditions of the permit."

SALEABLE MINERAL RESOURCE

36 CFR 228(c) Disposal of Mineral Materials

Generally, saleable minerals are common varieties of sand, stone, gravel, pumice, pumicite, cinders and clay. This also includes garnets used for industrial purposes. The authorities for selling these minerals differ for National Forest System lands reserved from the public domain and acquired National Forest System lands.[1] However, under all of these authorities the Secretary of Agriculture is solely responsible for disposals of saleable minerals located on National Forest System lands. Under all of these authorities, the Forest Service also has complete discretion to refuse to authorize disposals of saleable minerals.

Instruments for the disposal of saleable minerals do not convey an interest in land. Disposals are made for a term of years and may be subject to renewal if the operations have been diligently conducted. The Forest Service regulations governing the disposal of saleable minerals are set forth at 36 C.F.R. Part 228, Subpart C.

The authority for the disposal of saleable minerals located on National Forest System lands reserved from the public domain is the Materials Act of 1947, 30 U.S.C. §§ 601-604. Disposals under that Act must be to the highest responsible qualified bidder after formal advertising unless it is impracticable to obtain competition for the mineral or the mineral is given to a Federal, State or local government agency in connection with a public works improvement program. Disposals of saleable minerals from reserved lands are made by 1) competitive sale, 2) noncompetitive sale if it is in the public interest and it is impracticable to obtain competition for the mineral, 3) force account or contract where the mineral is used to carry out Forest Service programs involving construction or maintenance of physical improvements and 4) free use permit under certain limited circumstances.

The authority for disposal of saleable minerals located on acquired National Forest System lands with Weeks Act status stems from the Act of March 4, 1917, 16 U.S.C. § 520. That authority was revested in the Secretary of Agriculture by the Act of June 11, 1960 (74 Stat. 205) for lands actually acquired under the Weeks Act of 1911 (36 Stat. 961) and for lands given Weeks Act status by the

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1 An exception to this statement is Sec. 323 of the Act of Sept. 27, 1988 (102 Stat. 1774, 1827-28), which appears to govern the disposal of quartz on both reserved and acquired lands on that portion of the Ouachita National Forest located in the State of Arkansas.

Act of September 2, 1958,16 U.S.C. § 521a.[2] The only significant acreage of acquired National Forest System lands lacking Weeks Act status are those lands acquired under the Bankhead Jones Farm Tenant Act of 1937, ch. 517, § 32, 50 Stat. 525-26 (1937), which also lie outside the exterior boundaries of national forests.

The Forest Service has broad discretion in establishing procedures for the disposal of saleable minerals located on acquired National Forest System lands with Weeks Act status. The Secretary of Agriculture is authorized, under general regulations to be prescribed by him, to permit the prospecting, development, and utilization of saleable minerals on such acquired lands "upon such terms and for specified periods or otherwise, as he may deem to be for the best interests of the United States . . . ." 16 U.S.C. § 520. Disposals of saleable minerals from acquired land with Weeks Act status are made by:
1) competitive sale, 2) noncompetitive sale if it is in the public interest and it is impracticable to obtain competition for the mineral, 3) noncompetitive preference right sale to the holder of a prospecting permit who has found a suitable mineral deposit within the area covered by the prospecting permit, 4) force account or contract where the mineral is to used to carry out Forest Service programs involving construction or maintenance of physical improvements and 5) free use permit under certain limited circumstances.

Noncompetitive mineral material sales are permissible in a number of circumstances. They are authorized if it is impracticable to obtain competition for a saleable mineral disposal and that disposal is in the public interest. They may be used for the disposal of saleable minerals for the benefit of a federal, state or local government agency in connection with a public works improvement program if the public exigency will not permit delay incident to advertising. They are authorized for the disposal of saleable minerals appropriated for highway purposes by the Secretary of Transportation. Finally, they are authorized for the disposal of saleable minerals to be used in connection with the development of federal mineral leases if it is impracticable to obtain competition. Saleable minerals included in a noncompetitive sale are sold at appraised fair market value as determined by the Forest Service. The duration of a noncompetitive sale contract is 1 year or less with an opportunity to obtain two extensions of 1 year or less.

Prospecting permits may be issued for acquired National Forest System lands where existing information about saleable minerals is insufficient. A prospecting permittee who discovers a suitable deposit of such a mineral within the term of

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[2] The Act of September 2, 1958 gives Weeks Act status to all lands within the exterior boundaries of national forests which were acquired pursuant to authorities other than the Weeks Act.

the permit has a preference right to apply for a noncompetitive sale of that mineral. Such a permittee is not entitled to the sale. If the Forest Service determines that disposal of the suitable mineral deposit is appropriate, the permittee is awarded a noncompetitive preference right sale. Saleable minerals included in a preference right sale are sold at appraised fair market value as determined by the Forest Service. The duration of a preference right sale is 5 years or less with a renewal option of 5 years or less at the end of the initial term and each renewal period thereafter.

LOCATABLE MINERALS

General Mining Law

The United States Mining Laws govern the disposal of locatable minerals and are set forth at 30 U.S.C. §§ 21-54. The mining laws apply to all National Forest System lands reserved from the public domain pursuant to the Creative Act of 1891, § 24, 26 Stat. 1095, 1103 (1891) (repealed 1976), unless those lands have been formally withdrawn from the operation of the mining laws. Generally, locatable minerals are metals and rare earth elements such as uranium. However, uncommon varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay are also locatable minerals. Gem quality garnets used for that purpose are also considered locatable minerals when found on public domain lands.

A miner has a statutory right to enter lands subject to the mining laws to prospect for locatable minerals. Moreover, if the miner discovers a valuable deposit of a locatable mineral, the miner has a statutory right to mine that deposit. The miner pays no royalties or fees for the minerals extracted.

Authority to administer the mining laws is statutorily vested in the Department of the Interior. As such, the Interior adjudicates the validity of claims, (*i.e.* determines whether a miner has discovered a valuable mineral deposit and complied with the annual filing and fee requirements necessary to maintain a mining claim), processes patent applications, and determines whether federal lands are subject to the mining laws.

The role the Forest Service plays with regard to locatable mineral operations on National Forest System lands is to regulate the surface disturbance caused by those operations. The authority to regulate that surface disturbance is conferred by the Organic Administration Act, 16 U.S.C. §§ 478, 551. The Forest Service's implementing regulations are set forth at 36 C.F.R. Part 228, Subpart A. The extent to which the Forest Service may regulate surface disturbance caused by locatable mineral operations is limited. Generally, the Forest Service lacks authority to prohibit locatable mineral operations on lands subject to the mining laws.

Chapter 2: SURFACE MINING AND DREDGE AND PLACER OPERATIONS

This chapter describes procedures for preventing and minimizing water pollution during construction and mining.

When locating the boundaries of a surface mine, a buffer zone of undisturbed riparian vegetation must be left between the area to be worked and an existing stream channel or live body of water. If this is not possible, a stream alteration permit will be required from the Idaho Department of Water Resources (IDWR). Consult the Stream Channel Alteration Rules and Regulations issued by the Idaho Department of Water Resources and the following BMP's:

III.8	Stream Alteration	V.3	Vegetated Buffer Strip
		V.5	Brush Sediment Barrier
		V.7	Slash Filter Windrow

During the initial site preparation-construction phase of any surface mining operation, limit the amount of unvegetated ground. Best management practices should be installed prior to construction to limit and control runoff from unvegetated areas. Refer to the following BMP's:

V.1 Straw Bale Barriers
V.4 Silt Fence
V.5 Brush Sediment Barriers
V.6 Sediment Ponds
V.8 Log and Brush Check Dams

Design of open pits should include measures which prevent surface water from entering the workings. This can be accomplished by minimizing development near surface waters or by diverting streams and/or other surface water around developed areas. There may be situations, after mining is completed, where allowing surface water to flow into a pit would be preferable to creating or maintaining diversions around the pit. If water enters the pit, it may act as a recharge area to ground water and filter out sediments. Refer to the following BMP's:

III.1 Diversion Dike
III.8 Stream Alteration

When mining begins, topsoil and overburden should be segregated and stockpiled for use in reclamation. Topsoil stockpiles that will not be used within a year should be graded and seeded to prevent wind and water erosion and to help keep nutrients in the soil. Limit unnecessary materials handling by locating stockpiles away from potentially affected lands.

Each phase of the operation should be reclaimed concurrently during mining. This will help reduce erosion and water quality impacts and will spread reclamation costs over the life of the mine. During operations, inspect and clean sediment control structures to maintain their efficiency. If the best management practices are not effectively controlling sediment, consider an alternative best management practice or series of best management practices.

Before mining operations begin and during mining, an operator must consider, and plan for, how the site will be reclaimed. Reclamation measures may include but are not limited to:

1. Open pits should be backfilled where economically possible. Fill the pit or quarry with waste material and regrade to blend with the surrounding contour. Benching or terracing should also be considered to break up long slope lengths and control erosion. Establish positive drainage so that stagnant water ponds will not be created in backfilled pits. Use available topsoil or similar productive material to prepare the pit surface for revegetation. Note: A six (6) inch deep layer of topsoil is the minimum for revegetation efforts; and a twelve (12) inch deep layer is preferred.

If it is not practical to backfill the pit, the benches should be maintained as they provide stable surfaces for vegetative growth. When possible, the benches should be ripped, topsoiled, and seeded. Refer to the following BMP's:

I.3 Mulch-Straw
I.4 Mulch-Wood Chips

II.1 Topsoiling
II.2 Seedbed Preparation
II.3 General Planting and Seeding
II.4 Broadcast Seeding
II.8 Fertilizer Use

IV.1 Serration
IV.2 Benching

2. Other surface mining operations should be recontoured to the approximate original contour, topsoil replaced and seeded. Refer to the following BMP's:

I.3 Mulch-Straw
I.4 Mulch-Wood Chips

II.1 Topsoiling
II.2 Seedbed Preparation
II.3 General Planting and Seeding
II.4 Broadcast Seeding
II.5 Drill Seeding
II.6 Vegetative Planting
II.8 Fertilizer Use
II.9 Maintenance of Revegetated Areas

Chapter 5 SETTLING PONDS, PROCESS WATER PONDS, EVAPORATION PONDS, SLIME PONDS

The purpose of these BMP's is to ensure that settling ponds used in dredge and placer mining, process water ponds, evaporation ponds, and slime ponds are designed, operated, and reclaimed so that nonpoint source water pollution is minimized and water quality protected.

Both the Idaho Department of Water Resources and the Idaho Department of Health and Welfare (Division of Environmental Quality) have rules and regulations that may apply to settling pond design and construction. See Appendix A for specific authorities and requirements.

Settling ponds are used as:

1. Impoundments for process contaminated water derived from floating or dry land dredges, washing plants, sluicing, or other forms of placer mining that can deposit significant amounts of sediment into surface water.

2. Impoundments for sediment laden water running off excavated or stripped lands.

3. Impoundments designed for percolation, infiltration or evaporation of water.

Process water ponds are used as:

1. Make-up water ponds for dredge and placer mining, surface mining, or milling operations.

2. Make-up water or holding ponds to store clean water for placer mining operations.

3. Recycle ponds for reducing the volume of fresh make-up water used in an operation.

Evaporation Ponds are used as a means of getting rid of process water either by evaporation, percolation, or infiltration without discharging it.

Slime ponds are used in the phosphate industry for the storage of phosphatic clay waste derived from the beneficiation of phosphate ore.

PRE-MINING SITE EVALUATION

Before commencing construction for mining operations that require the use of ponds, conduct a site evaluation, including adequate sampling, to determine the economic extent of the ore body as well as the best location to set up the plant and build support facilities. This information will provide guidelines for determining the amount of surface to be uncovered in the initial construction phase, as well as assist the miner in determining the size and location of settling pond(s).

Analyze the soil at the site to determine the percentage of clay, sand, and silt it contains. This information will dictate the amount of time water must be retained in the pond to allow sediments to settle out and will impact the size and number of ponds needed for the mining operation. Suspended solids and sediment from sandy soil will settle faster than those high in clay or silt. Note: Discharging water from a settling pond to a stream requires a National Pollutant Discharge Elimination System (NPDES) Permit issued by the Environmental Protection Agency.

LOCATION CRITERIA

Settling ponds may either be permanent or moved during the course of mining. The following criteria should be considered when locating ponds:

1. Ponds should be located in a geologically stable area, at least fifty (50) feet away from streams or other surface waters.

2. Ponds should be kept out of active floodplains. This will eliminate the need for diverting streams around the ponds and will reduce reclamation requirements. If a pond is in a flood plain, all the sediment must be removed and the area stabilized upon completion of the mining project.

3. Ponds should be located so all surface water may be diverted around them. This might necessitate diverting streams and other surface water away from the site. Refer to the following BMP's:

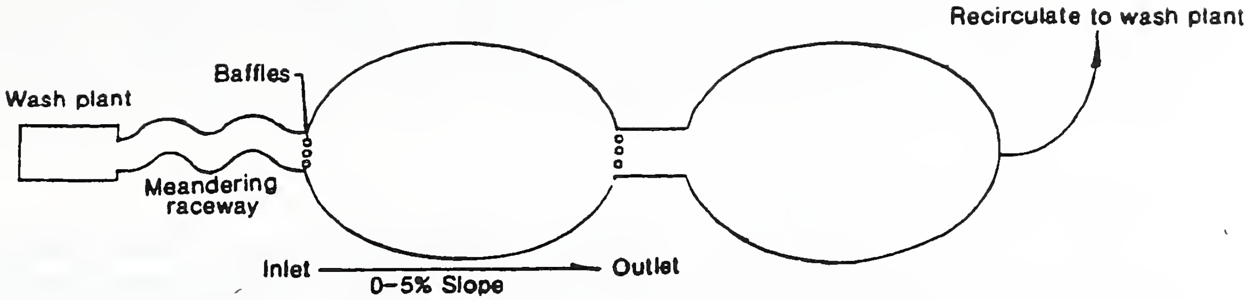
III.1	Diversion Dike/Ditch	III.8	Stream Alteration
III.2	Interceptor Trench		

4. Ponds should be located so ground water seepage into the pond is kept at a minimum. This can be done by lining the pond with bentonite clay or other impermeable liners, or by installing cut-off trenches around the pond to decrease ground water infiltration. If the pond is lined, a drain field may have to be installed below the liner to reduce hydrostatic pressures against the liners caused by the ground water.

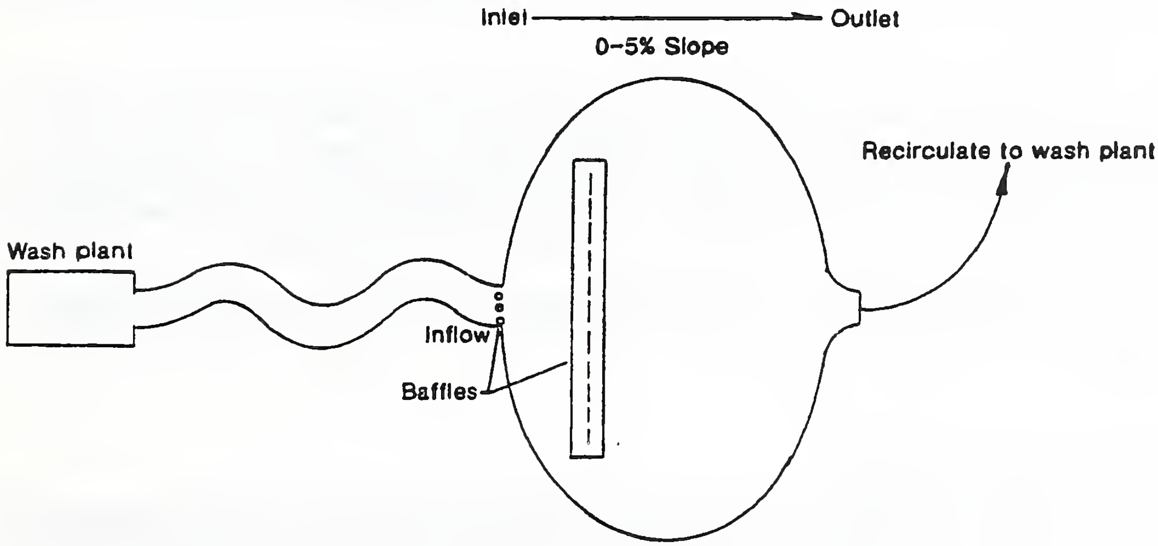
DESIGN CRITERIA

1. Settling ponds should be designed by a qualified specialist in accordance with current engineering practices.

2. Several settling ponds in series are often preferable to one large pond. (See Figure 5-1) Water can be retained for a longer period in multiple ponds, thus allowing sediments more time to settle out before water is discharged. One pond in the series might be the principle sediment trap while another could be used to hold "clarified" water that could be recirculated through a processing plant.



STANDARD SETTLING PONDS IN SERIES



SETTLING POND WITH BAFFLES

DIAGRAM OF SETTLING PONDS FOR PLACER MINING

FIGURE 5-1

3. Ponds should be designed so their length is greater than their width. A 2:1 ratio is adequate, although a 5:1 ratio is preferred. A long length to width ratio helps reduce the velocity of water flowing through the pond, which increases the stability of the embankment. Reduced velocities also enhance the settlement of solids.

4. Design the pond so that it is large enough to contain all sediment laden process water as well as seepage, surface runoff, and precipitation from the design storm event. The pond must be large enough to provide a minimum freeboard of two (2) feet at all times. It is beneficial if size constraints conform to the physical configuration of the site.

CONSTRUCTION CRITERIA

1. If the pond cannot be built below ground level, build the pond embankment on clean, stable foundation material. This will help prevent seepage between the embankment and the foundation material. Seepage could cause piping and subsequent failure of the embankment.

2. Construct the containment embankment of well compacted, competent soil, free of organic debris.

3. Settling ponds can also be excavated below ground level with a compacted embankment placed above the ground surface as an additional safety factor. This method also increases the holding capacity of the pond (See Figure 5-2). If ponds are excavated below ground level, the foundation should be constructed so water cannot seep out of the pond into adjacent streams or other surface waters.

4. Depending upon whether the ponds will be operated as an open (discharging) or closed (non-discharging) system, a spillway will need to be installed so sediment free water can be decanted. In all cases, an emergency spillway must also be installed. Spillways must be riprapped with a coarse material to prevent erosion of the toe of the dam. Anti-seep collars must be placed around spillways to prevent seepage and eventual washout of the spillway.

5. The settling pond must be completed, ready for use, and all surface flows should be diverted around the pond, before general mining activities commence.

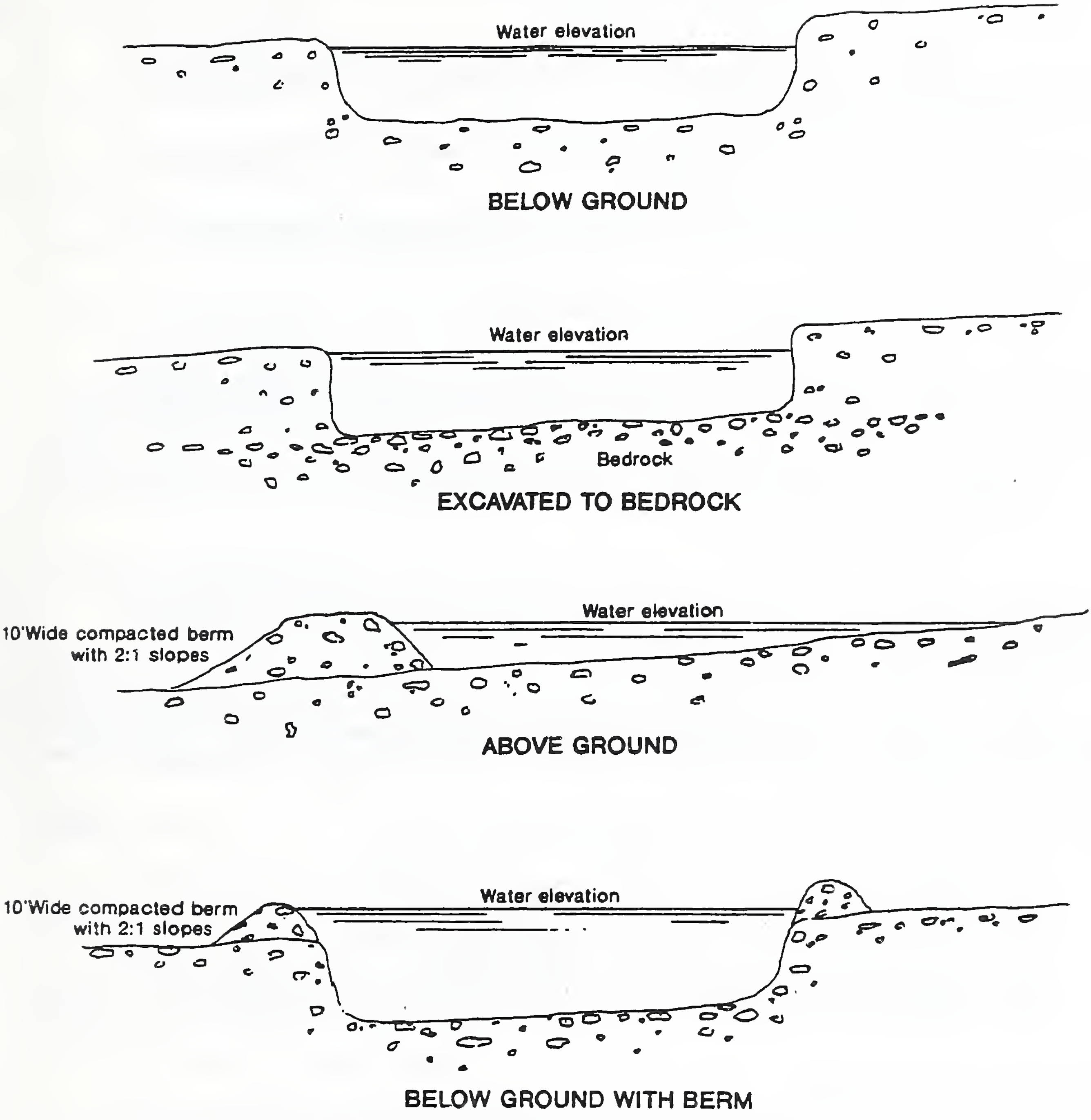
OPERATING PARAMETERS

1. While operating do not fill the pond with solid sediments exceeding 60% of the designed storage volume. If this limit is reached, some of the sediments should be removed and deposited elsewhere or used for reclamation.

2. Always maintain at least two (2) feet of freeboard in the ponds. This is especially important during spring runoff, periods of high precipitation, and for non-discharging ponds.

3. At the close of the mining season, decant sediment free water onto vegetated ground to allow sufficient freeboard for direct precipitation during seasonal closure. This will help preserve the structural integrity of the pond embankment.

4. Chemical flocculants such as alum or lime can be added to settling ponds to reduce the length of time needed to settle out solids.



SETTLING POND CONSTRUCTION OPTIONS

FIGURE 5-2

RECLAMATION ALTERNATIVES FOR SETTLING PONDS

If ponds are located in an active flood plain:

1. Dewater the pond onto vegetated ground before commencing additional rehabilitation work. Unless an NPDES permit has been issued, there can be no discharge to surface waters.

2. Remove all sediments away from the floodplain. This can be done with a dragline, front end loader, or trackhoe.

3. Recontour the sides and floor of the pond to blend with the surrounding topography.

4. Seed and fertilize the recontoured area.

5. Another alternative is to complete reasonable stabilization work on the sides of the pond and then leave it intact for fish rearing or wildlife habitat. Seeding and revegetation of the embankment around the pond must be completed to stabilize the area.

If ponds have not been located in an active flood plain:

1. Dewater the pond.

2. Remove some or all of the sediments and stabilize them in an approved area. Recontour the entire site and make the perimeter of the pond irregular by adding fill to some sections while removing it from other areas. Seed, fertilize and mulch the recontoured area.

3. Another alternative is to stablize the sediments in place by putting a cap of coarse material over the fines to a depth of three (3) feet or more. Then recontour the pond to conform as much as possible to the surrounding topography. Replace topsoil and seed.

Refer to the following BMP's when reclaiming settling ponds:

I.3	Mulch-Straw	II.4	Broadcast Seeding
I.4	Mulch-Wood Chip	II.5	Drill Seeding
		II.6	Vegetative Planting
II.1	Topsoiling	II.8	Fertilizer Use
II.2	Seedbed Preparation	II.9	Maintenance of Revegetated Areas
II.3	General Planting and Seeding		

PROCESS WATER PONDS

Ponds constructed to hold process water, other than that containing cyanide, should be designed by a qualified specialist using current engineering practices and should take into account the criteria outlined under settling ponds. Ponds built to hold process water containing cyanide must be designed in accordance with the guidelines and requirements set forth in Rules and Regulations for Ore Processing by Cyanidation administered by the Idaho Department of Health and Welfare - Division of Environmental Quality.

Process water ponds must be designed as a closed system, meaning there is no discharge. The water is recycled for process water after being circulated through the tailings/settling ponds. Process water systems usually contain the following elements:

1. A collection and conveyance system that stores and transports water from the mine/mill to a holding pond.

2. A pump and conveyance system to transport water from the holding pond back to the mine or mill.

3. A conveyance system to transport process contaminated water from the mine or mill to the tailings/settling pond.

4. A pump and conveyance system to carry water from the tailings pond to the holding pond.

Closed circuit process water systems help protect water quality, and make mining/milling possible over a longer season in areas with minimum precipitation. One drawback to these systems is that process water quality can be affected by suspended solids or chemicals that were not removed while the water was held in the tailings/settling pond. Another disadvantage is that where other water supplies are limited, there must be a large, non-mineralized area for pond construction.

EVAPORATION PONDS

Large holding ponds may be used to evaporate water which will alleviate the need to discharge it. Discharge from mines and mills must be collected and conveyed to a large evaporation pond or series of ponds. The system should be large enough so all water can be evaporated, with no discharge occurring. The bottom of the pond should be lined with an impermeable material to prevent seepage into and out of the impoundment. (See Figure 5-2)

SLIME PONDS

Slime ponds are used exclusively in phosphate mining to store phosphatic clay waste. The ponds are created by pumping slime containing 90-98% water and 2-10% suspended solids into an impoundment area behind an earthen dam.

Slime ponds must be designed by a qualified specialist using current engineering practices and should take into account the criteria set forth in this chapter and Chapter 4 - Mill Tailings Impoundments.

RECLAMATION OF SLIME PONDS

Slime ponds are difficult to reclaim because of the high volume of water in the pond, and because a percentage of the suspended solids are so fine (colloidal) they will not settle out. One viable reclamation alternative is to plant deep rooted woody vegetation (varieties of saltbush, quailbush, catclaw acacia, cattails, and leadplant) adjacent to the pond to increase transpiration rates.

Section I. BMP'S FOR SOIL STABILIZATION

Contents and Applicability

Best Management Practices (BMP's):

Temporary Treatments:

I.1 Matting - Plastic. Plastic matting can be used for dust and erosion control during construction on bare soils. It also aids early vegetative growth by increasing moisture holding capacity of the soil. Plastic net can be used as a temporary or permanent treatment for grass establishment and slope stabilization.

I.2 Erosion Control Blanket. A commercially made matting used for erosion control and slope stabilization. It is made of jute or straw and plastic netting.

I.3 Mulch - Straw. A temporary mulch which will last from one to two years. The straw will deteriorate without detrimental effects on plant growth or plant establishment.

I.4 Mulch-Wood Chips. A temporary mulch of small sized wood chips made from the trunks and branches of trees.

I.5 Compaction. A mechanical method of increasing the density of soil to reduce settling and improve resistance to erosion.

Permanent Treatments:

I.6 Gabions -- Rock-filled wire baskets for use in retaining walls or drainage stabilization.

I.7 Riprap -- A permanent rock or aggregate layer placed over the soil to protect against erosion.

I.8 Native Rock Retaining Walls -- A low wall made from locally available rock used to stabilize steep slopes.

I.9 Timing of Construction and Control Applications -- The sequence of construction activities and erosion control application to minimize erosion created by construction disturbance.

I.10 Limited Surface Disturbance -- Limiting the amount of bare soil to the minimum area required to conduct construction activities.

I.11 Biotechnical Stabilization -- Biotechnical stabilization involves using live layers of brush imbedded in the ground to control or prevent surficial erosion and mass failure of slopes. Biotechnical stabilization techniques are most effective when shrubs are cut and utilized during their dormant periods.

I.1 Matting - Plastic

Plastic Sheet matting are sheets of polyethylene plastic placed on the soil surface.

Purpose: For temporary erosion control and the protection of sprouted seeds and/or young vegetation. Matting also decreases soil moisture loss and helps hold in heat. Plastic net matting can be used to cover straw mulch as a temporary aide. It can also be used as permanent treatment for establishing grass (without mulching) and for slope stabilization. Plastic sheeting is the most effective matting for retaining moisture in the soil. Its durability depends on the thickness of the sheet. Plastic matting can provide protection from erosion for 6 to 12 months. One disadvantage in using plastic sheeting is that it blocks sunlight and can therefore retard vegetative growth.

Specifications: (See Figure I-1 – Use similar techniques)

Individual rolls should be laid up and down the slope instead of along the contour. The rolls should be overlapped a minimum of four (4) inches, with the uphill roll overlapping the downhill roll. The edge of the sheeting should be stapled to the ground or buried to prevent movement. When mats are used, it is critical to ensure good contact between the mat and the soil to prevent erosion under the matting. If the sheeting or netting is damaged, it should be replaced immediately.

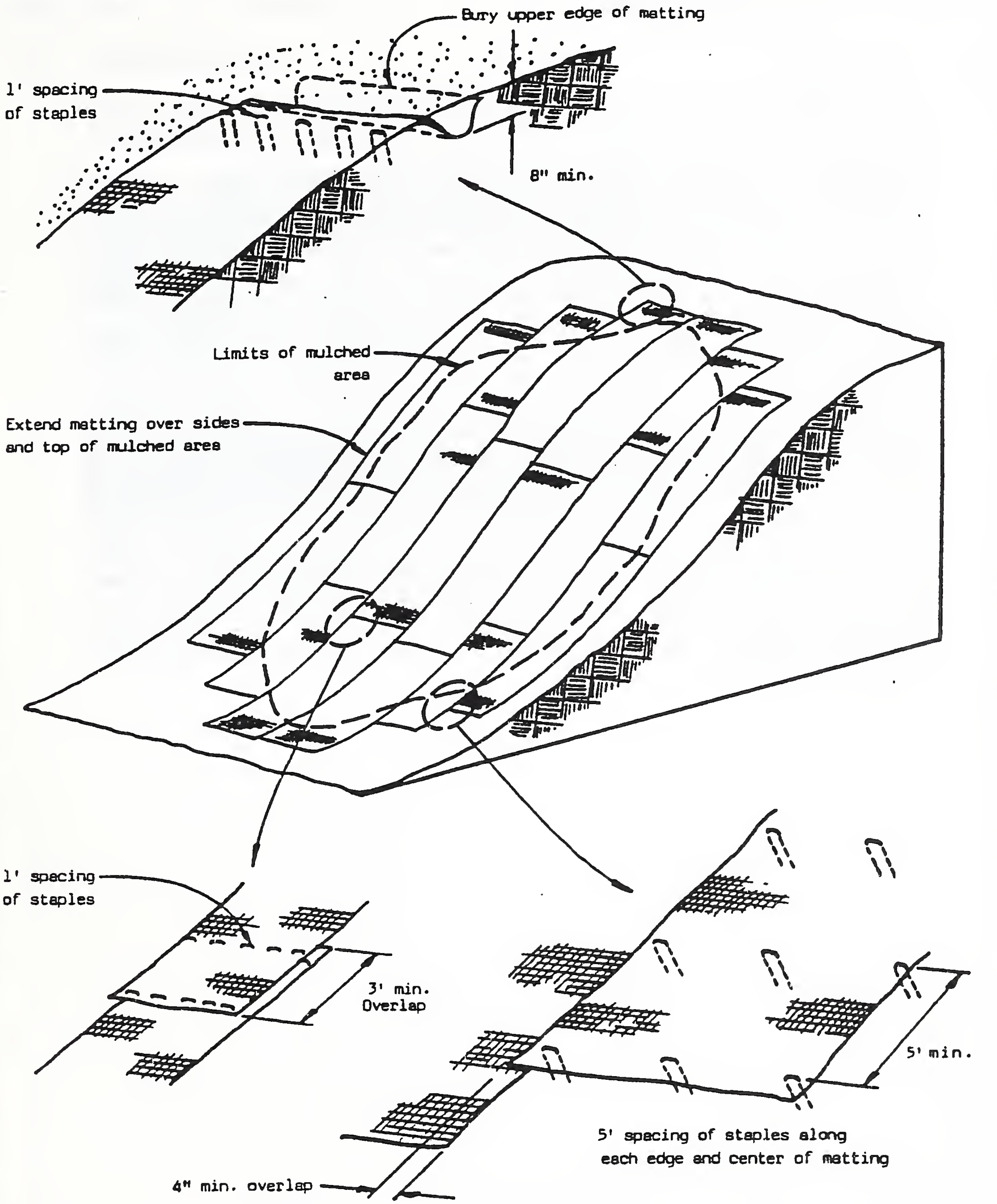
I.2 Erosion Control Blanket

Erosion control blankets are made of jute or straw and plastic netting.

Purpose: Used for slope stabilization, erosion control, and the protection of other mulches from wind and water damage. Jute and straw matting have better erosion control characteristics than straw. Erosion control blanket may be more expensive than using straw mulch secured with nylon, plastic, fabric, wire, or woven paper netting.

Specifications: (See Figure I-1)

Individual rolls should be laid up and down the slope instead of along the contour. The rolls should be overlapped a minimum of three (3) feet with the uphill roll overlapping the downhill roll. The rolls should also be overlapped on each side a minimum of four (4) inches. The matting should be stapled to the ground with staples placed one (1) foot apart. The matting should extend beyond the edge of the mulch, with at least one (1) foot at the sides and three (3) feet at the top. The top edge should be buried in a trench at least eight (8) inches deep. The matting should be laid as smooth as possible.



BLANKET INSTALLATION
FIGURE I-1

I.3 Mulch-Straw

Mulch-straw should be clean (weed free) wheat, barley, or rice straw.

Purpose: Used as a cover over bare or seeded soil. Mulch helps soil retain moisture and nutrients, it helps reduce soil temperatures, reduces erosion and assists in establishing vegetative growth. Straw mulch can be used on slopes to help prevent wind and water erosion. The mulch however, must be held in place by matting or crimping. Straw mulch held by nylon netting may be used in lieu of jute matting as a cost saving measure. Straw mulch is a reasonably priced, effective erosion control aid. Its effectiveness will decrease with time.

Specifications:

Straw mulch can be hand broadcast or blown on by a mechanical mulcher. It should be applied so there is uniform coverage with a maximum depth of two (2) to three (3) inches (approximately 2 tons per acre). A mulch depth of four (4) inches is acceptable where frost occurs. (Excessive mulching can reduce the nutrient level of the soil) If a deep layer of mulch is used, consider applying a slow release fertilizer to help promote vegetative growth. The mulch can be rolled over with a mechanical device (sheep foot roller), to "punch" it into the ground, or be covered with matting. The mulch can also be covered with nylon, plastic, fabric, wire or woven paper netting held in place by staples. It can also be sprayed with a chemical tackifier such as asphalt emulsion.

I.4 Mulch-Wood Chips

Wood chips are made from processing tree trunks and branches in a wood chipper (do not use kiln or air dried lumber).

Purpose: Small sized wood chips are used as a temporary cover over bare or seeded soil to help reduce erosion and assist in reestablishing vegetative growth. Wood chip mulch is a reasonably priced, effective erosion control aid.

Specifications:

Wood chips are hand broadcast or blown by a mechanical mulcher. Chips should be applied so there is uniform coverage to a depth of approximately three (3) inches. The wood chip mulch can be covered with various types of erosion control netting, held in place by staples, or with a chemical tackifier such as asphalt emulsion. Wood chip mulch can be used in lieu of jute and straw matting or straw mulch. Wood chips may cause an imbalance in soil nutrients when they break down, so additional fertilizer (up to 25% more) will need to be applied if wood chips are used as mulch.

I.5 Compaction

Compaction is a means of controlling erosion by increasing the soil density which improves its strength and decreases long term soil settlement.

Purpose: Compaction is useful in stabilizing fill materials.

Specifications:

Soil compaction is usually accomplished by using a sheep foot roller on clayey soil and a smooth roller on sandy soil. Dozers or heavy equipment can also be used. Care must be taken so the surface soil is not compacted too much, as this will reduce revegetation efforts.

Compaction has a tendency to increase runoff, therefore sediment control structures (as described in Section II) need to be installed below compacted areas. The surface of compacted structures should be scarified, seeded, or seeded and mulched. This will increase the effectiveness of the BMP.

I.6 Gabions

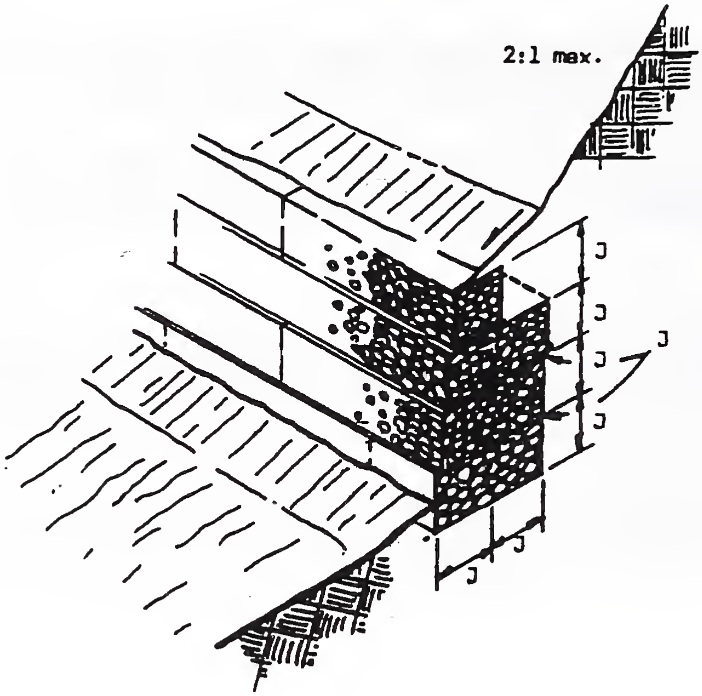
Gabions are rectangular wire boxes or baskets, filled with rocks and wired together. They must be assembled in place.

Purpose: They are usually placed on steep slopes as permanent erosion control structures and are particularly useful where water seepage is anticipated. Gabions are also useful for channel stabilization.

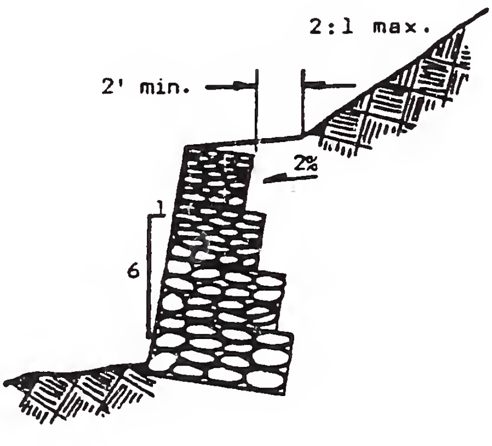
Specifications: (See Figure I-6)

Construction specifications should be prepared by professionals familiar with gabion use. The site must be graded prior to installation. Following grading, the wire baskets are placed in position, wired together, and filled with four (4) to eight (8) inch diameter rocks.

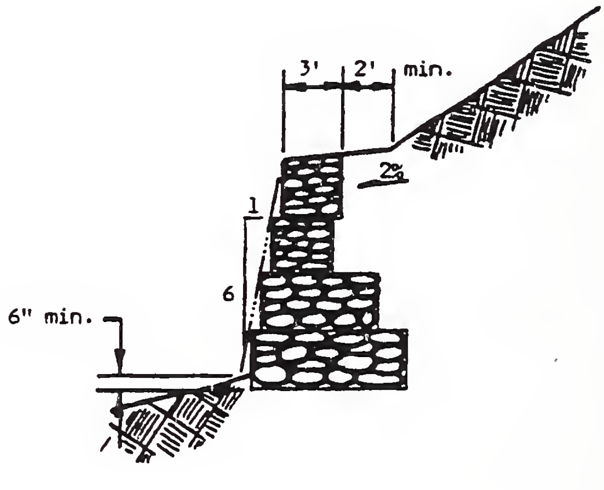
Maintenance: The gabion should be periodically inspected for signs of undercutting and instability.



3-DIMENSIONAL



SECTION



SECTION

GABION RETAINING WALLS
FIGURE I-6

I.7 Riprap

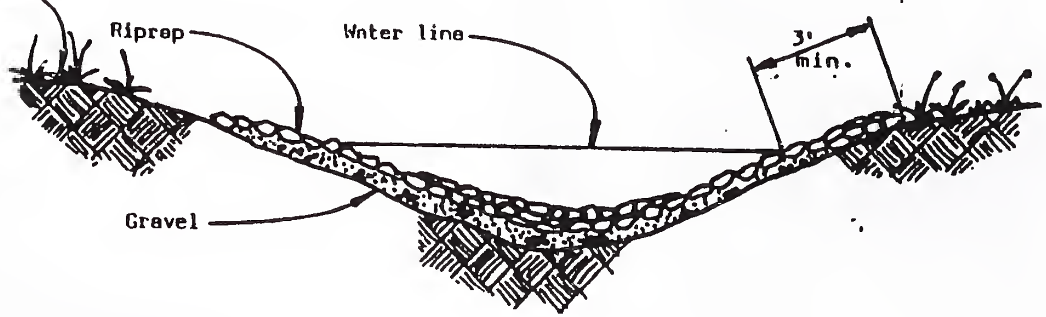
Riprap is a layer of loose, hard, angular rock placed over soil to help protect against erosion.

Purpose: It is used below culverts, drainage outlets, along shorelines and stream banks, and as a lining in ditches and channels.

Specifications: (See Figure I-7)

A layer of filter material (plastic filter cloth, geotextile fabric, or a layer of sand, gravel or small stones) should be placed between the soil and the riprap to prevent migration of soils through the riprap. Riprap can be installed by hand or with heavy equipment. When installing the riprap, care should be taken so the filter material is not damaged and segregation of the stone size is prevented. A well graded mixture of rocks (well graded mixtures are composed primarily of large stones with an adequate supply of smaller cobbles to fill the voids between the larger rocks) is then placed over the filter material to a depth of six (6) inches or more. When installing riprap in channels, it should be extended from three (3) feet below the water line to a point above the high water mark where vegetation can be established. On a site specific basis, riprap must be properly sized to the maximum flow velocity, to prevent erosion.

Maintenance: Routine inspections should be made on riprapped areas to ensure that the material has not been displaced. Damaged areas should be repaired immediately.



RIP RAPPED DITCH OR CHANNEL
FIGURE I-7

I.8 Native Rock Retaining Walls

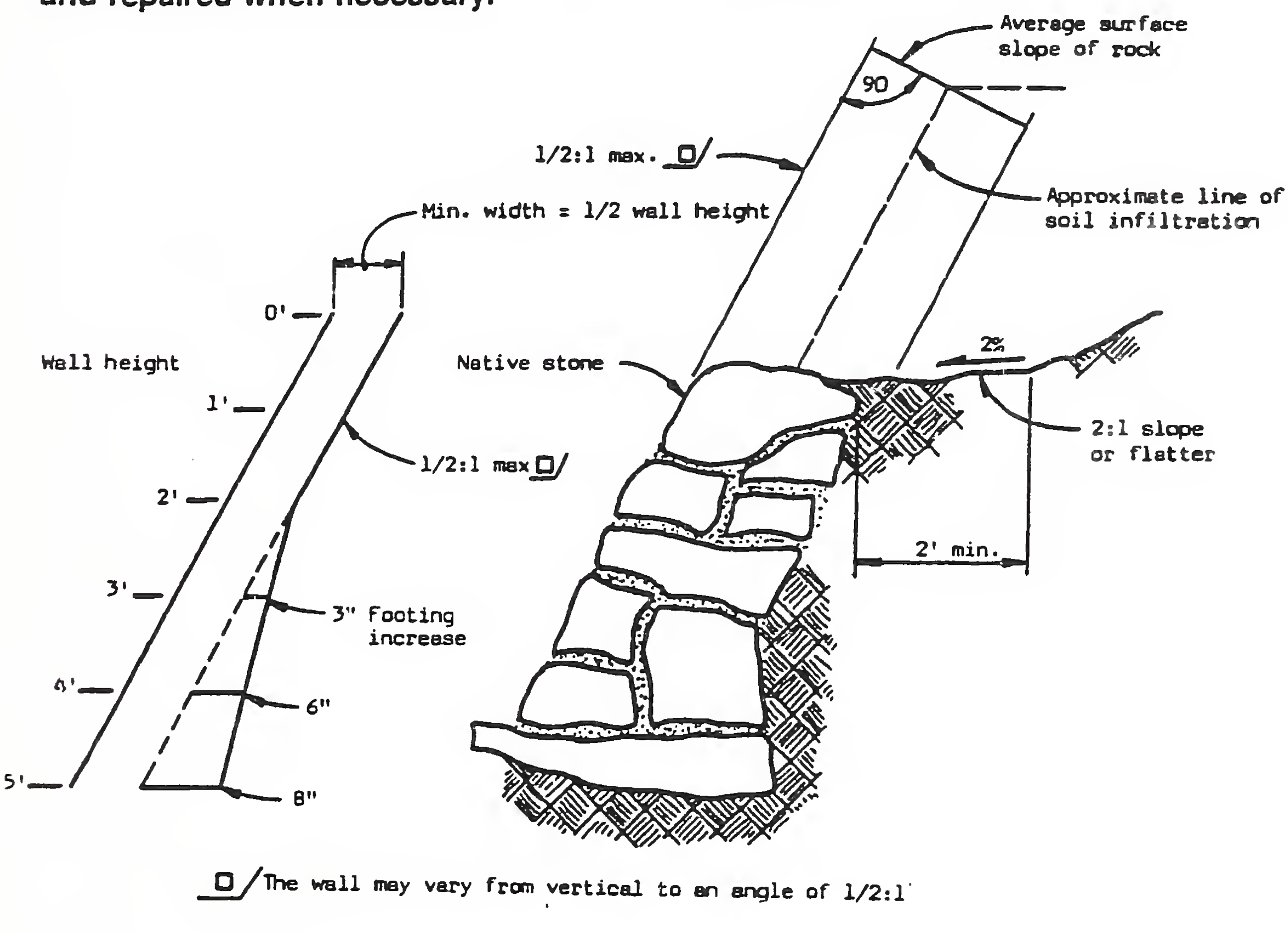
A native rock retaining wall is a wall constructed of native rocks which provides an aesthetically attractive means for physically stablilizing slopes.

Purpose: Retaining walls are usually constructed on steep slopes which are up to five (5) feet in height and that cannot be effectively regraded or stablilized by another method.

Specifications: (See Figure I-8)

Before installing the retaining wall all large rocks should be removed from the face of the slope where the wall is to be placed. Then a "footing" trench should be put in at the toe of the slope. Large rocks are then placed in this footing trench as indicated in Figure I-8. Arrange additional layers so that each rock above the foundation is securely placed on the ones beneath it. After completing the retaining wall, the footing trench must be backfilled. The slope above the wall should be vegetated, where applicable.

Maintenance: Native rock retaining walls must be inspected periodically and repaired when necessary.



NATIVE ROCK RETAINING WALL

FIGURE I-8

I.9 Timing of Construction and Control Applications

The timing of construction and installation of erosion control measures is of utmost importance. Construction should be undertaken during periods when the potential for erosion is at the lowest, i.e. during periods of low seasonal precipitation and runoff. Under all conditions, erosion control measures should be installed in stages to protect work already completed. In highly erodible areas, sediment control measures should be installed before general construction activities commence.

I.10 Limited Surface Disturbance

The amount of disturbed land should be kept to a minimum. This will reduce the amount of bare soil exposed to erosion and help control run-off sedimentation. Concurrent reclamation should be carried out as work progresses to help minimize the amount of disturbed soil.

I.11 Biotechnical Stabilization

Biotechnical stabilization involves using live layers of brush imbedded in the ground to control or prevent surficial erosion and mass failure of slopes. Biotechnical stabilization techniques are most effective when shrubs are cut and utilized during their dormant periods.

Purpose: Biotechnical stabilization is a cost effective method of controlling erosion on and mass failure of slopes, especially steep cut slopes adjacent to roadways.

Specifications: (See Figure I-11)

1. Cut branches and stems (up to three inches in diameter) of willows, alder, or poplar during the dormant season (fall - early spring).

2. Lay the branches and stems atop successive lifts of compacted soil (horizontal terraces cut into the slope) in a criss-cross fashion so the stem will extend the full width of the compacted fill. Branches should protrude from the compacted fill as shown in Figure I-11.

3. Cover criss-crossed branches and stems with a layer of compacted fill.

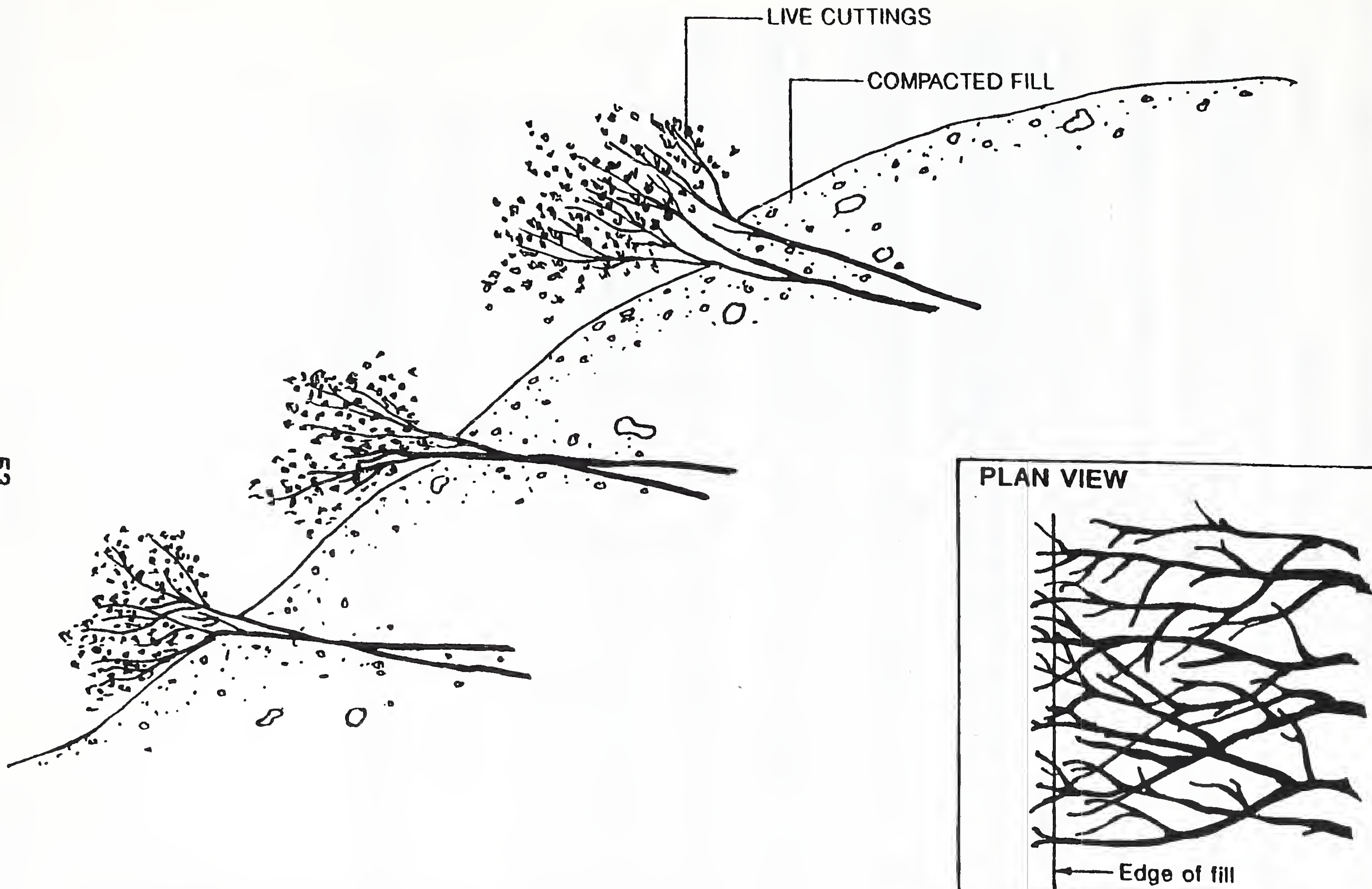
4. Space brush layers three to five feet apart. Closer Spacing of brush layers might be necessary near the toe of the slope.

5. Continue alternating brush layers with compacted fill as you proceed up the slope from the toe to the top.

6. After a reasonable period of time, roots and shoots will develop. The live vegetation that grows from the cuttings are effective in controlling erosion.

Maintenance: Once vegetation has been established, maintenance will not be required.

CROSS SECTION VIEW



BIOTECHNICAL STABILIZATION
FIGURE I-11

BMP'S FOR SEEDING & REVEGETATION

Contents and Applicability

Best Management Practices (BMP's):

II.1 Topsoiling. Placement of topsoil over a prepared subsoil for the purpose of enhancing revegetation conditions.

II.2 Seedbed Preparation. Preparation of the soil surface to provide better plant growth conditions prior to seeding.

II.3 General Planting and Seeding Specifications. Information applicable to revegetating disturbed lands.

II.4 Broadcast Seeding. Planting seed by scattering seed over the surface of the soil. This seeding method is most useful on small sites, for repairing damage, or for very large, low angle rock areas.

II.5 Drill Seeding. Planting seed with an agricultural drill. This seeding method is most useful on large, low angle sites with loose, non-rocky soil.

II.6 Vegetative Planting. The method for planting living plants and trees.

II.7 Willow Cutting Establishment. The method for selecting and planting willow cuttings.

II.8 Fertilizer Use. General guidelines for use of fertilizer. Specific techniques for fertilizer use with revegetation methods using seed or live plants.

II.9 Maintenance of Revegetated Areas. Protective measures, irrigation, fencing, fertilization and repair measures for areas being revegetated.

II.1 Topsoiling

Topsoiling is the placement of topsoil or other suitable plant growth material over a prepared subsoil.

Purpose: To provide a suitable soil medium for vegetative growth.

Specifications:

The practice is recommended on slopes 2:1 or flatter where the native soil is unsuitable for vegetative growth. Topsoiling may only consist of replacing topsoils that were stripped and stockpiled during initial development activities. Topsoil should be a loam consisting of varying proportions of organic matter, clay, silt, and sand. It should be free of stones, weeds, and inorganic debris. In most mining operations, the top six (6) to twelve (12) inches of soil is stockpiled as topsoil.

Care must be taken when applying topsoil so it is not laid on top of a subsoil of contrasting texture. This could cause the topsoil to slough if water flows between the topsoil and the subsoil.

The following guidelines should be considered when replacing topsoil. However, site specific conditions will have an impact on topsoil availability and application rates.

1. The existing grade of the subsoil should be maintained.

2. Lime may need to be applied to acidic soil to adjust the pH to a more neutral pH of around 7.

3. Topsoil should be uniformly distributed at a minimum compaction depth of two (2) inches (6 to 12 inches is preferred) on slopes graded 3:1 or steeper. It should reach a depth of four (4) inches on slopes flatter than 3:1.

4. Topsoil should not be applied when the subsoil is frozen or extremely wet.

5. The operator should plan on a reduction in soil volume between salvage, stockpiling, and replacement activities. This volume loss could be as much as thirty percent.

II.2 Seedbed Preparation

Seedbed preparation entails preparing the soil by ripping, discing, scarifying, and adding soil amendments to make the soil more productive and enhance revegetation efforts.

Purpose: To promote successful revegetation efforts by preparing the soil for planting and creating proper seedbed conditions.

Specifications:

Seed bed preparation is applicable for all sites to be revegetated by seeding. Seed germination and seedling establishment are enhanced by loosening the surface of the soil by hand or machine raking prior to planting and then covering the seeds by raking or scarifying the soil to a depth of 1/4 to 1/2 inch. Good seed germination and establishment is also obtained by seeding on one (1) to six (6) inches of snow.

Seedbed preparation including weed control and soil tillage are essential for successful sowing and the establishment of seedlings. Weeds must be controlled by mechanical means or by spraying.

Good seedbed preparation may be difficult to achieve. Areas to be seeded should be ripped or scarified, to a minimum depth of three (3) inches. The soil should be worked to establish suitable conditions in which the seeding equipment can be operated. Areas to be seeded by broadcasting should be tilled immediately before seeding to a depth of two (2) inches, except on benches where no additional preparation is necessary or possible.

Seeding areas can be separated into the following types:

1. Rocky areas which are untillable.

2. Benched areas need no preparation as sloughing of soil from the bench above will tend to cover seeds.

3. Very steep areas (steeper than 2:1, a 50% slope, a 27° slope) are extremely difficult to seed. Hydro seeding or broadcast seeding should be used at these sites. Dragging a cleated cat track across slope will do a satisfactory job in loosening the soil.

4. Steep areas (between 2:1 and 3:1, between a 50% and a 33% slope, or between a 27° and a 18° slope) can be cat-walked up and down in most soils. This leaves a good seedbed by firming the loose soils and loosening the hard soils. This work should be completed immediately prior to seed application. Note: Rough, loose seedbeds on all steep slopes is important to help retain water, nutrients, and promote infiltration. Roughened seedbeds also help enhance hydroseeding efforts.

5. Sloped areas (3:1 or flatter, less than a 33% slope, less than a 18° slope) can be prepared with conventional equipment such as discs, harrows, or rippers and a grader. Slopes that exceed 10° should be prepared with cleated equipment such as a sheep foot roller. Fill slopes, flatter than 3:1 may not need to be prepared before seeding, however, they should be checked for satisfactory seedbed conditions.

II.3 General Planting and Seeding Specifications

These are general guidelines that apply to all planting and seeding operations. They are designed to enhance the success of revegetation efforts. These guidelines are applicable to most revegetation and landscaping work.

The Soil Conservation Service (SCS) is a good source of information on seed and planting specifications in addition to Appendix D.

Seeding and Planting Guidelines:

1. Annual grasses and legumes are recommended for quick cover, rapid temporary soil protection, or as a nurse crop combined with slower growing perennials. Perennial grasses and legumes, shrubs and trees are for continual soil protection.

2. All grasses, legumes, shrubs, and trees used in revegetation should be certified as viable and be effective for erosion control and soil stabilization.

3. Most legumes should be inoculated with appropriate bacteria before seeding since many varieties will not germinate without being inoculated.

4. Trees and shrubs can be used to provide lasting vegetative stabilization and should protect the soil surface after the grasses and legumes decline. Trees and shrubs, however, may not survive in all climates, and species selection for reclamation should be based on site specific conditions. See appendix D.

5. Trees, shrubs, and grasses, used in revegetation, should be of a similar species to that existing prior to mining. This will assist in maintaining the biological integrity of the area being reclaimed.

Site Evaluation and Modification of Revegetation Methods:

1. Existing soil survey reports should be consulted for each revegetation site or area. All sites should be inspected and/or tested by a soil scientist for texture, organic matter content, drainage, slope, and aspect. Testing for potentially toxic elements, water holding capacity, and nutrient levels should be done by a soils lab.

2. When the pH of the soil is less than 5.5 (acidic soil), seedling establishment may be limited. Lime can be added to increase the soil pH to a more neutral pH of 7. Lime should be applied at a rate determined by soil testing and it should be tilled into the top four (4) to six (6) inches of soil. Powdered lime or waste treatment lime can be used.

3. When the frost heave potential of the site is determined to be high to moderate, the following precautions should be taken:

   a. Planting and seeding should be conducted from May 1 to August 1. Supplemental irrigation will be required in this case for germination and seedling establishment.

   b. Mulch rates should be increased 50 percent over those specified in chapter 1, to 3 tons of straw per acre.

   c. Areas damaged by frost heaving (after the initial seeding season) should be repaired to original specifications, if possible. The mulch rate on the repaired area should be 50 percent greater than the original application rate.

   d. Follow-up application of fertilizer should be made each spring for the first two (2) years following the initial seeding to help plants establish and maintain vigorous growth and develop extensive root systems which will help to stabilize the soil.

Some seeds require pretreatment prior to planting. Check with seed suppliers to ascertain the need for and/or acquire treated seed. Shrubs and trees may be seeded or planted from bare root or potted stock. Cuttings from some species can also be taken from native stock adjacent to the area and planted in moist ground. Bare root shrubs and trees should be kept bundled and in cold storage prior to receipt and before planting. Potted trees and shrubs should be stored in the shade, outdoors, and should be sprinkled periodically with water to keep the soil moist.

Season of Seeding:

Selection of the proper season for seeding is vital in ensure successful revegetation. Even if all other conditions are satisfactory, if the timing of the seeding is poor, the seedlings are likely to die. Seeding in the fall is preferable. Early spring seeding is also acceptable.

Fall seeding is most successful in Idaho. Field experience has shown that seeding on one (1) to six (6) inches of snow over freshly scarified soil produces excellent germination. Spring seeding is most successful on northern facing exposures. Generally, the greatest potential for seeding failure is from freezing of the young plants prior to establishment.

When seeding in the spring, moisture conditions may not be adequate for establishment. In this case, the seedlings may not survive dry summer weather.

II.4 Broadcast Seeding

Broadcast seeding is the process of uniformly casting seeds and fertilizer on the soil by hand or mechanical means.

Purpose: Broadcast seeding is employed when seeding grasses, shrubs, forbes, or trees on flat surfaces and slopes where other seeding methods are not appropriate. Broadcast seeding is well suited for use on steep slopes, rocky areas, abandoned roadways, sites with limited access, and where hand labor is used.

Specifications:

The following procedures are recommended for the most successful application and growth. These procedures should be followed only after the seedbed has been prepared:

1. Apply fertilizer and work it into the soil. Fertilizer can also be applied either at the same time or after the seeds have been broadcast. Check the soil analysis for fertilizer application rate.

2. Apply seed by either wet (hydroseeding) or dry broadcasting. Seeds placed in a hydroseeder should be used within 30 minutes of having been put in water. In general, broadcast seeding rates must be twice the drill seeding rate.

3. Where applicable and if mulch is not going to be applied, lightly rake over the broadcast seed. The soil cover will help protect the seed and facilitate germination. Seeds covered with 1/4 to 1/2 inch of soil will have a better germination rate than those left on the surface of the ground.

4. Apply mulch, when necessary, either by hand or with a mechanical mulcher.

5. On steep slopes that are inaccessible, and where other methods are impractical, seeding should be done with a hydromulcher or by broadcasting.

II.5 Drill Seeding

Drill seeding is the process of planting seed and fertilizer using an agricultural or rangeland drill seeder.

Purpose: This method is most effective on flat, non-rocky surfaces. Drill seeding provides the maximum possibility for successful germination and growth, with a minimum investment in fertilizer, seed, and labor because seeds are not damaged or carried away by wind, water, animals, or birds.

Specifications:

The following procedures are recommended for the most successful application and growth rate:

1. The soil must be loose enough to allow penetration of the drill disc to a depth of approximately two (2) inches. This will help ensure that seeds are not planted too deep or left on the surface of the ground.
2. Fertilizer should be applied at specified rates after soil analysis at an appropriate soil laboratory.
3. On steep slopes where drilling equipment cannot be used, broadcast seeding methods should be utilized.

II.6 Vegetative Planting

Vegetative planting means the establishment of vegetation by planting trees and shrubs from nursery stock or transplants.

Purpose: Planting vegetation is an effective means of promoting soil stability and controlling erosion; however, until establishment is complete the site is vulnerable to erosion. Trees and shrubs should be planted in conjunction with grasses and legumes to enhance the overall effectiveness of soil stabilization efforts and erosion control measures.

Specifications: (See Figure II-6)

The following procedures are recommended for the most successful establishment of vegetation:

1. Choose plant species native to the area and that match specific habitats. The type of vegetation planted may be dependent on the intended use of the site following reclamation. In this case, native vegetation might not be the preferred alternative.

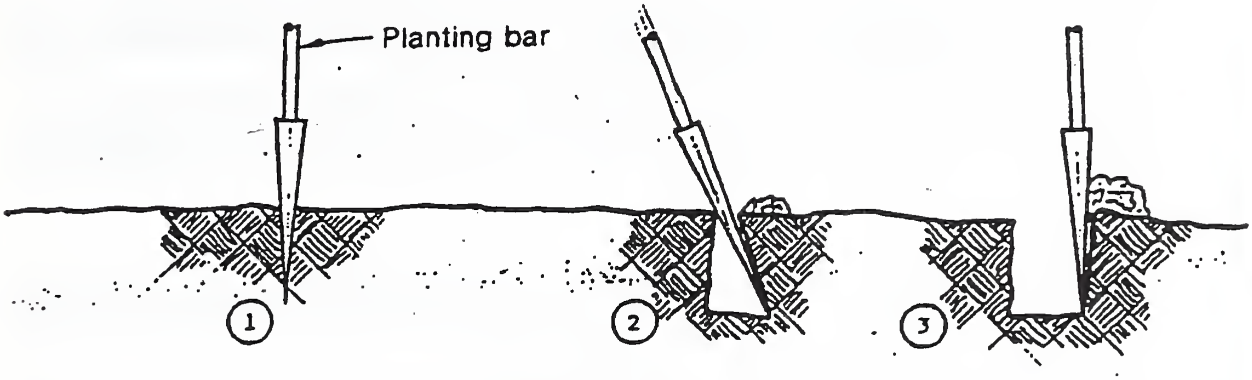
2. Planting holes should be prepared as shown in Figure II-6. Seedlings should be placed in the hole so the crown of the plant is at the surface of the soil. The roots should not be folded and there should be no air space around the roots.

3. Planting should be supervised by someone skilled in revegetative techniques.

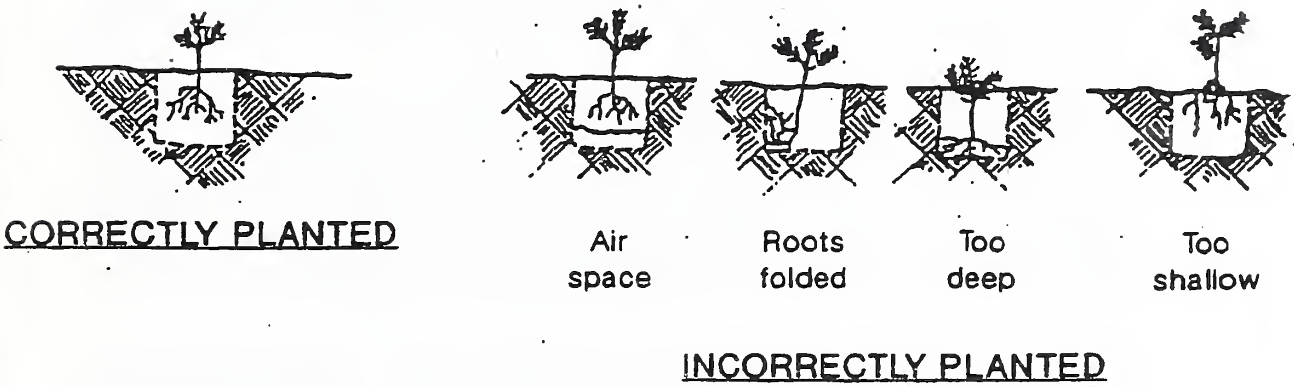
4. Fertilizer should be applied as specified by the manufacturer or in accordance with soil testing results.

5. The survival rate of vegetation will be increased if plants are irrigated regularly during the first two (2) years after planting.

Maintenance: Adequate maintenance following planting is absolutely essential for maximum success of the revegetative efforts. Fencing may be required to protect planted areas where there is livestock grazing or wildlife use.



PREPARATION OF PLANTING HOLE USING PLANTING BAR



VEGETATIVE PLANTING
FIGURE II-6

II.7 Willow Cutting Establishment

Willow cutting establishment is the process of selecting and planting willow cuttings to help stabilize streambanks. Planting willow can also enhance fish and wildlife habitat.

Purpose: To stabilize streambanks and other reclaimed areas adjacent to water.

Specifications:

Planting of willow cuttings is recommended when completing streambank stabilization efforts or in areas adjacent to water where there is enough moisture for cuttings to take hold and grow.

The guidelines listed below should be followed when selecting and planting willow cuttings:

1. Select varieties that are indigenous to the area in which you wish to re-establish willows. Select varieties compatible with your objective and the stream size, i.e. shrubby types for outside curves, tree types for shade areas, small varieties for small streams.

2. Cuttings should have smooth bark and should come from willow stock two years or older.

3. Make cuttings at joint or at ground level so the natural appearance of the parent plant is preserved. Trim back root end to a diagonal cut, approximately one-half inch below a leaf node.

4. Cover top of cutting with pruning seal or latex paint immediately after cutting. This will help prevent damaging the cuttings and ensure they are oriented correctly when planted. Remove all leaves and side branches and keep at least the bottom one-third of the cutting emersed in water. If cuttings must be stored for more than a week, wrap bundled cuttings with burlap and store in a cool place. Soak stored cuttings in water for 24 hours before planting.

5. Cuttings must be planted in soil that will remain moist during the growing season. Cuttings need to be anchored or protected against erosion until established. Do not leave air pockets around cuttings.

6. Cuttings should be long enough so one or two bud nodes are in permanent contact with moisture. Three to four bud nodes should be above ground.

7. Plant shrubby type willows one - three feet apart. Plant in a random pattern. Avoid planting in rows. Cuttings can be planted in shallow trenches along stream banks. They can also be anchored in holes excavated below the scour line (scour - to clear, dig or remove by a powerful current of water) in the channel bottom adjacent to the bank.

For more detailed information on willow planting, contact the Aberdeen Plant Material Center, Aberdeen, Idaho, or the Idaho Department of Water Resources.

II.8 Fertilizer Use

The following guidelines can be used to select fertilizer types. The guidelines will help prevent improper or excessive use of fertilizer that may result in water quality impacts or damage vegetation. The techniques are applicable to all revegetation efforts.

Purpose: Fertilizer(s) should only be used when soils are deficient in nutrients which retard or impair vegetative growth. The use of fertilizer will promote revegetation efforts if the proper type and amounts are applied.

Specifications:

The following guidelines pertain to types of fertilizer:

1. Slow release fertilizer. This type of fertilizer is one of the most reliable methods of providing nutrients for plants. It is best adapted to application during seeding, vegetative planting and maintenance of established vegetation. Recommended application rates are usually specified on the fertilizer container.

2. Fast release fertilizer. This type of fertilizer releases nutrients rapidly, making them available for immediate use by plants, which makes it most adaptable to maintenance operations after vegetation has been established. When fast release fertilizer is applied at the same time as seeds, nutrients can be leached out of the ground before the seeds germinate. Application rates are usually specified on the fertilizer container. If fast release fertilizer is needed, chose a type that contains nitrogen, phosphorus, and sulfur. Nitrogen maintains plant growth and phosphorus aids in root establishment and initial plant growth. Sulfur should be included in the fertilizer as some soils are deficient in this nutrient.

3. If fertilizer is applied at the recommended rate and fails to promote or increase vegetative growth over that which would occur naturally, do not apply more fertilizer. Instead, have the soil tested and follow the recommendations of the test report.

4. Excessive or incorrect use of fertilizer can cause more harm than good. For example, excessive nitrogen can kill seedlings, particularly in dry areas. Fertilizer should be applied, by broadcast methods, after seeding has been completed. Operations which apply fertilizer, usually apply between four hundred (400) and one thousand (1000) pounds per acre. <u>Note: Fertilizer type and application rate should be based on soil tests.</u>

II.9 Maintenance of Revegetated Areas

Maintenance can include, but is not limited to, irrigating, fencing, fertilizing, and repairing revegetated areas to help ensure the success of revegetation efforts. These measures should be applied to sites revegetated within the past one (1) to five (5) years.

1. Irrigation: Provisions for irrigation, especially on dry lands, should be included in the initial reclamation plan. On areas that will require irrigation to ensure that the plants or seeds do not die, the following measures should be taken:

   a) Keep the soil moist from planting time until the seeds germinate.

   b) Water frequently during the growing season so that the soil retains enough moisture to ensure plant growth. Try to coordinate irrigation with natural precipitation so the site is not over-watered.

   c) During the second growing season, after plants are established, the frequency of watering can be reduced. This will help plants become accustomed to natural conditions but it will provide sufficient water for growth during the season.

2. Fencing: All revegetated areas that are potentially subject to heavy use by either livestock or wildlife before the plants have become established, should be fenced to ensure adequate regeneration.

3. Fertilizing: In some instances it is beneficial to apply fertilizer after the first growing season to help ensure and enhance revegetative efforts. Site specific conditions and soil testing should dictate whether fertilizer should be applied and at what application rates.

4. Repairs: Repairs could include reseeding, repairing damage caused by wind and water erosion or damages caused by animals and man. All damage should be repaired as soon as possible after it occurs. Site specific conditions will dictate what repairs are necessary.

Section III: BMP'S FOR RUNOFF COLLECTION

Contents and Applicability

Best Management Practices (BMP's):

III.1 Diversion Dike/Ditch. Diversion dikes/ditches should be used whenever it is necessary to dispose of concentrated surface water without causing erosion. Diversions should be used in conjunction with a silt fence or sediment ponds.

III.2 Interceptor Trench. Used to interrupt long slope faces on gentle slopes (less than 3:1) and to allow diversion and infiltration of collected runoff and retention of sediment.

III.3 Open Top Box Culverts. A temporary or permanent drainage collection system. Should be used in conjunction with a silt fence and riprap.

III.4 Siltation Berm. A temporary impermeable berm for use on construction sites to retain runoff water on site.

III.5 Waterbars. A berm constructed across the roadway to divert storm runoff away from unpaved surfaces or other disturbed areas.

III.6 Culverts. Corrugated metal pipes used for runoff collection and conveyance.

III.7 Drain Fields. A drainage system constructed of rock or rock and perforated pipe, used to drain water away from construction sites.

III.8 Stream Alteration. The diversion of a stream into a new channel, pipe, or culvert.

III.9 Drop Structures. Natural materials such as rocks and trees that are put in streams for stabilization, controlling water velocities, and creating fish habitat.

III.10 Rolling Dips. Structures that are designed into a road surface when it is being surveyed that are intended to divert water off the road surface. Rolling dips are the result of gradual grade changes along a length of road.

III.11 Road Sloping. Selectively constructing or grading a road surface to direct surface water runoff in a desired direction, usually to the outside of the road.

III.12 Roadway Surface Water Deflectors. A roadway surface water deflector is a runoff interceptor built of treated wood and conveyor belt. The deflector is installed across the roadbed to convey surface water off the roadbed.

III.1 Diversion Dike/Ditch

A diversion dike/ditch is a runoff interceptor built to divert surface water away from un-vegetated areas on to adjacent vegetated ground. Diversions are also used to divert creeks or streams away from mine areas.

Purpose: Diversion dikes should be used to route surface waters around structures such as tailings impoundments, settling ponds, or any other mine facility.

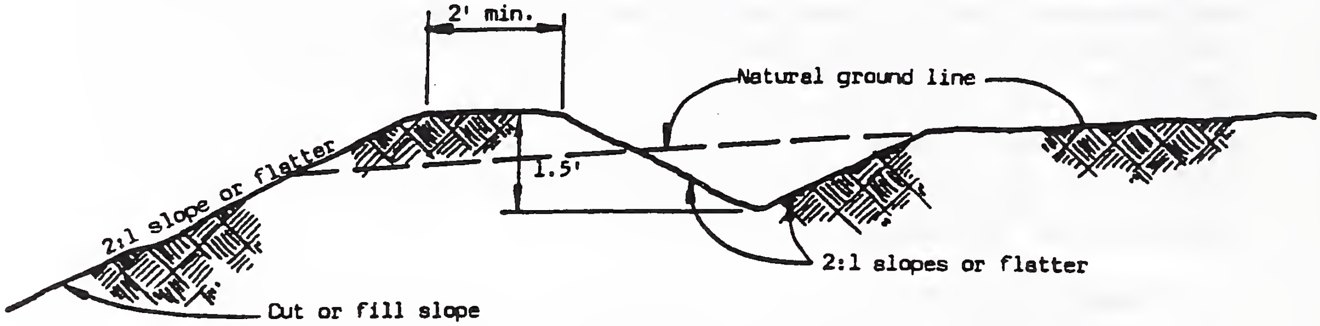
Specifications: (See Figure III-1 and III-2)

1. Height: 1.5 feet or greater.
2. Width at top: two (2) feet minimum.
3. Side slope of dike: 2:1 or flatter.
4. Compaction: should be adequate to ensure a stable dike that will not erode or wash out easily.
5. Grade: for grades in excess of 2% or where large flows are anticipated the diversion channel may need to be mechanically stabilized with a concrete or riprap lining.

The diversion dike consists of a trench and dike. The trench can be constructed by using either heavy equipment or hand tools. The bottom and sides of the ditch should be riprapped with rocks or lined with a geotextile fabric. This will help stabilize the sides of the ditch and reduce sediment loading in the water caused by the bare ditch banks. Dike banks above the water line should be seeded.

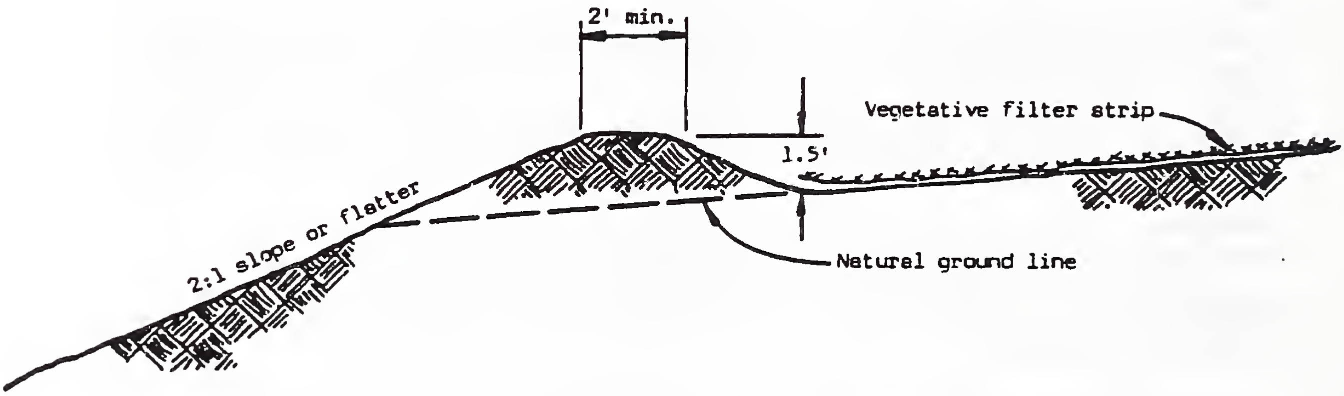
Diversion dikes should be designed large enough to carry normal runoff volumes, as well as additional water from a major storm event.

Maintenance: Diversion dikes should be inspected regularly and repaired if damaged.



NOTE: Bed of dike to be riprapped.

SECTION



NOTES: 1) Dike constructed by dozer moving soil upslope and dumping at top of slope.
2) Outlet to stabilized vegetated soil.

SECTION

DIVERSION DIKE/DITCH

FIGURE III-1

III.2 Interceptor Trench

An interceptor trench is a trench built along the contour of a slope to store and/or divert surface runoff. An interceptor trench is smaller and less permanent than a diversion dike/ditch. In addition, it is designed to carry surface runoff only, not streams.

Purpose: Interceptor trenches can be used to divert water around mining structures such as stockpiles, waste dumps, pits, settling ponds, or tailings impoundments. Interceptor trenches are effective on gentle slopes (3:1 or less) with long, uninterrupted expanses.

Specifications: (See Figure III-1, III-2)

Locate and construct the interceptor trench so that it lies along the contour of the slope and can discharge onto stable, preferably vegetated, ground. The trench should be large enough to carry normal volumes of water as well as additional precipitation from a major storm event. Excess material should be cast on the downhill side of the trench. The trench banks (above the water line) and adjacent disturbed ground should be seeded immediately after construction is completed. The slope of the trench must not exceed two (2) percent in order to prevent erosion of the trench.

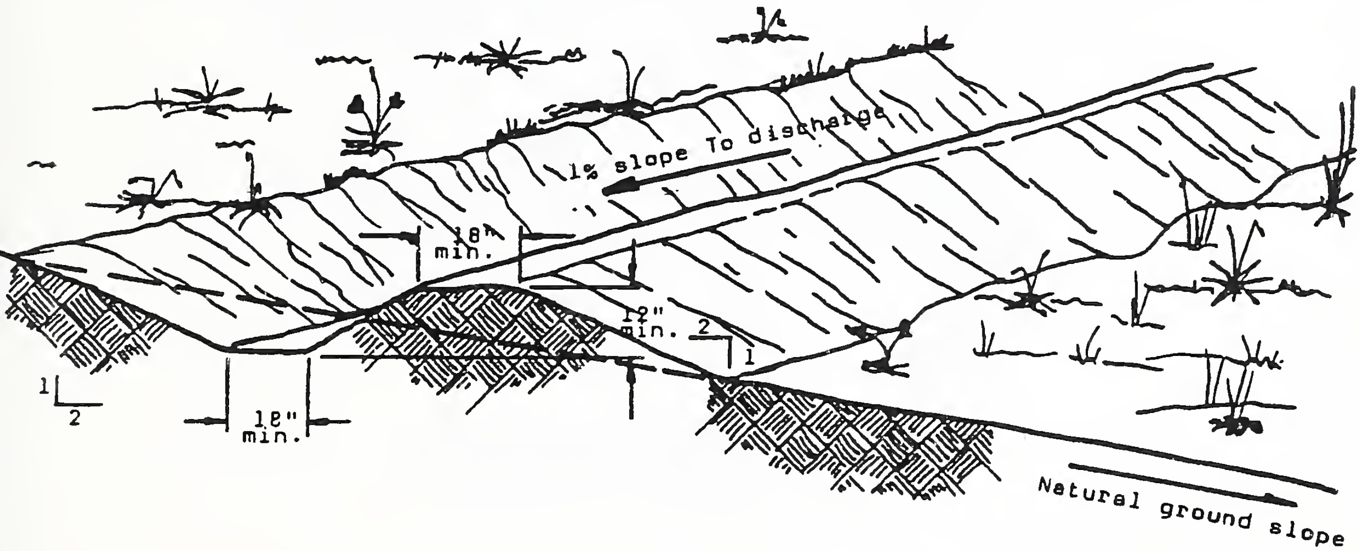
1. Depth of trench: twelve (12) inches minimum at downslope side.

2. Width at bottom of trench: eighteen (18) inches minimum.

3. Slope of sides of trench: 2:1 or flatter.

The bottom of the trench should be riprapped with rocks or lined with a geotextile fabric. This will help reduce sediment load in the water caused by the eroding of the ditch banks.

Maintenance: Interceptor trenches should be inspected regularly and repaired if damaged.



INTERCEPTOR TRENCH

FIGURE III-2

III.3 Open Top Box Culverts

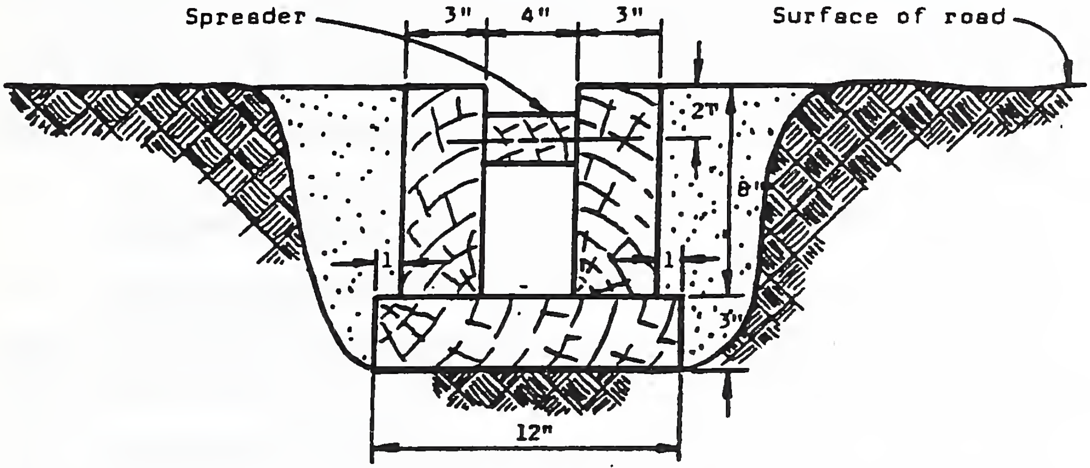
An open top box culvert is a wooden culvert installed across the roadbed to convey surface runoff and flow from inside ditches onto the downhill slope of the road.

Purpose: The open top box culvert can be installed on lightly used, unpaved roads with steep grades (greater than 6%). This type of culvert can be used as a substitute for pipe culverts.

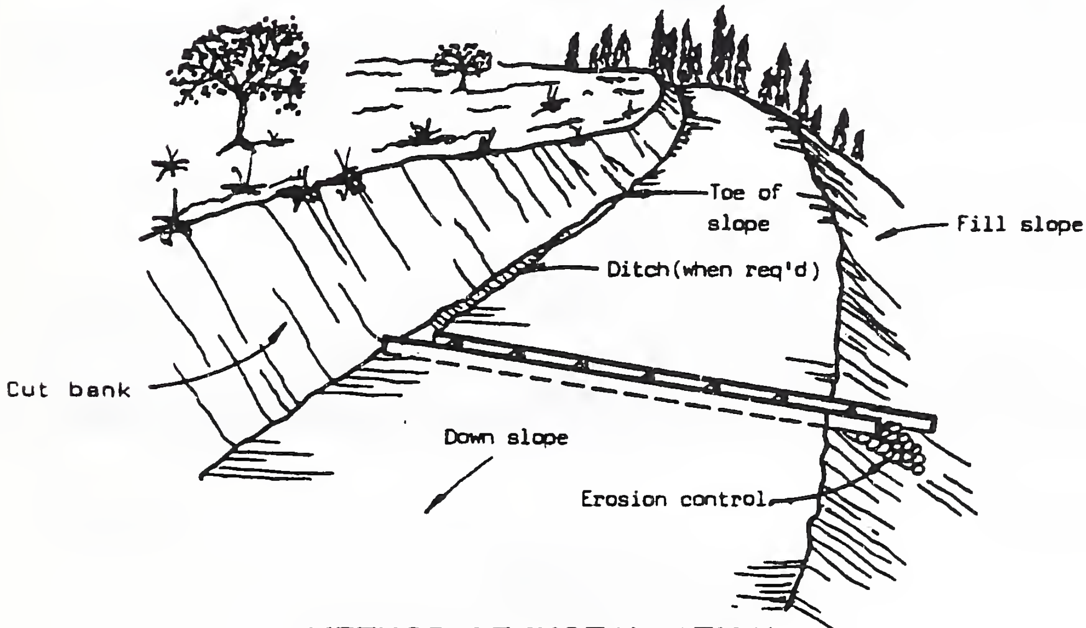
Specifications: (See Figure III-3)

Box culverts can be constructed with logs, lumber, guardrails, or corrugated steel. They consist of open-top, three-sided, box-like frames installed flush with the road surface and angled downward across the roadway. The inflow end should be at the same grade as the side ditches on the road and should extend into the cut bank. The discharge end should extend six (6) to twelve (12) inches beyond the surface of the roadbed and should be directed onto vegetated ground, riprap or into another erosion control structure such as a sediment trap or catch basin.

Maintenance: Open top box culverts should be inspected, cleaned, and repaired on a regular basis as needed.



END VIEW



METHOD OF INSTALLATION

OPEN TOP BOX CULVERT
FIGURE III-3

III.4 Siltation Berm

A siltation berm is an impermeable barrier placed around a disturbed site to capture and contain surface runoff so that sediment can be filtered prior to discharging the water. Siltation berms should be placed on the downslope side of the disturbed ground.

Specifications (See Figure III-4)

1. Berms should be large enough to control runoff water from a major storm event.

2. The berm should be constructed of the following materials:

   a) 3/4 to 1 1/2 inch gravel, or other, similar coarse material;

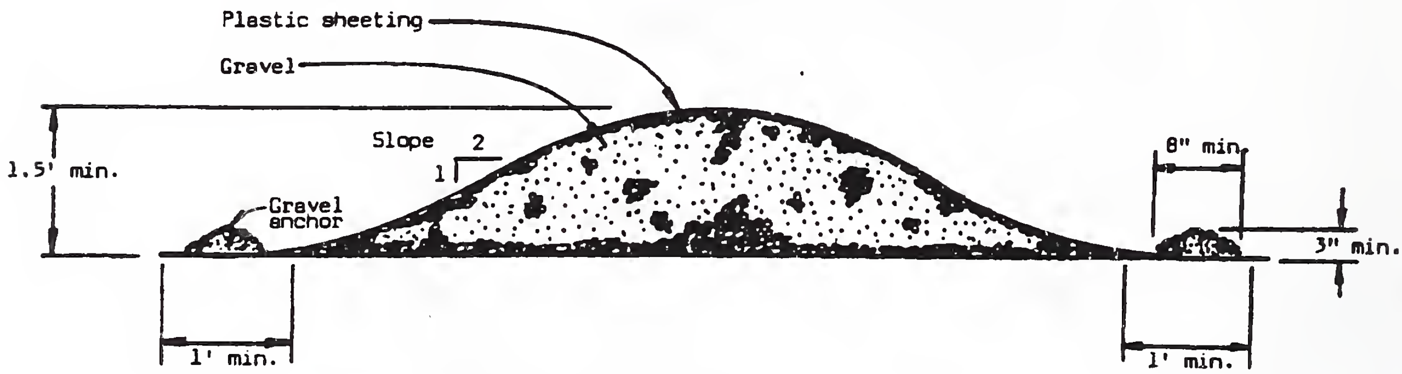
   b) plastic sheeting, at least six millimeters thick, and wide enough to cover the berm and allow a two foot overlap on each side of the berm.

3. The berm should be located along the contour of the slope at the downhill boundary of the disturbed ground.

4. Gravel or another coarse material should be mounded into a ridge, with a slope not to exceed 2:1, of sufficient height to contain runoff water from a design storm event.

5. Plastic sheeting should be placed over the berm and anchored down as indicated in Figure III-4.

Maintenance: Siltation berms should be inspected regularly and repaired immediately when damaged.



SILTATION BERM

FIGURE III-4

III.5 Waterbars

A waterbar is a berm built at a downslope angle, extending across the length of the roadway.

Purpose: Waterbars reduce erosion by diverting runoff away from the road surface. These erosion control structures can be either permanent or temporary for lightly used unimproved roads.

Specifications: (See Figure III-5)

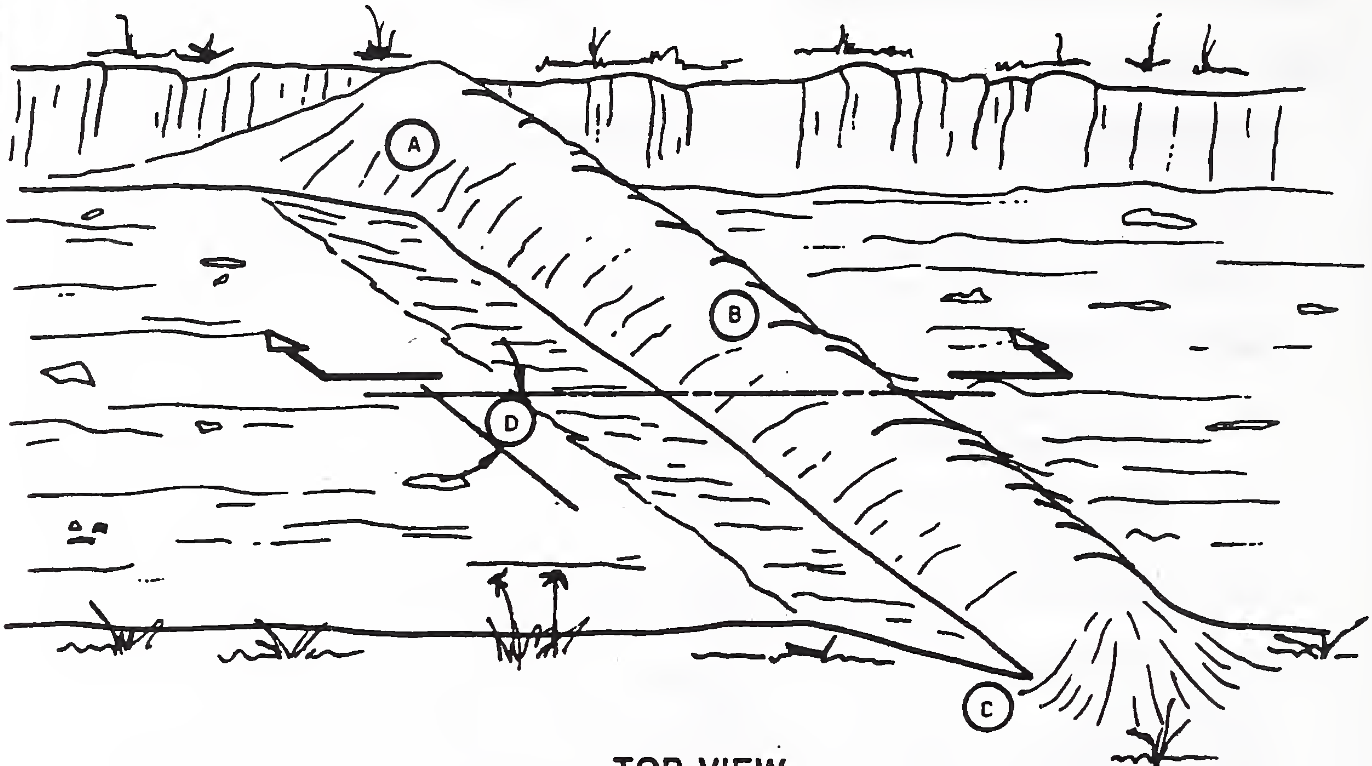
1. Waterbars should extend from the cutbank side of the road across to the fillslope side.

2. Berm height should be twelve (12) to twenty-four (24) inches above the roadbed.

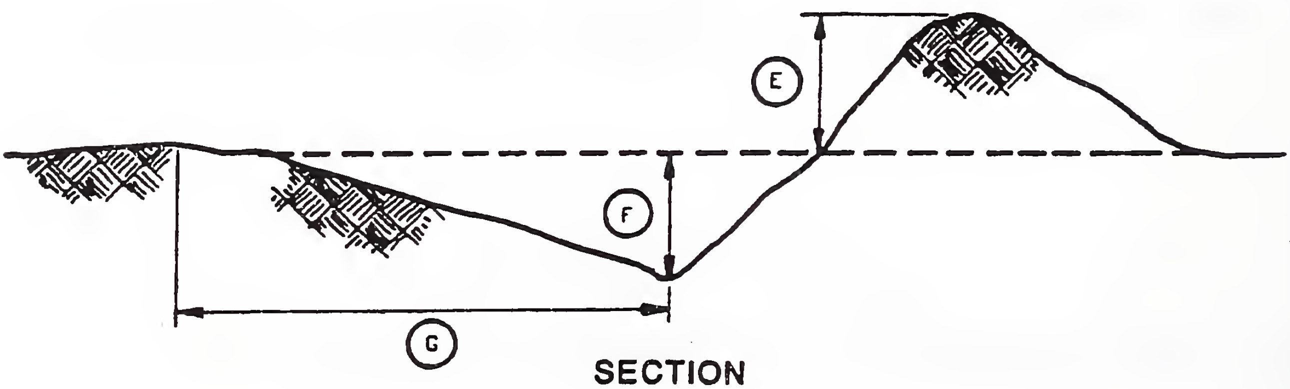
3. Berms should have a downslope angle of between 30% and 40%.

4. Waterbars can be built with a dozer or by hand.

Maintenance: Properly constructed waterbars should require little or no maintenance. They should be kept open at the discharge end so that water can flow away from the roadway. Silt fence, riprap, or a slash filter windrow may need to be installed below the discharge end of the waterbar to control erosion and trap sediment.



TOP VIEW



SECTION

WATERBAR (CROSSDITCH). Construction for unpaved forest roads with limited or restricted traffic. Specifications are average and may be adjusted to gradient and other conditions. A, bank tie-in point cut 6 to 12 in. into roadbed; B, cross drain berm height 12 to 24 in. above roadbed; C, drain outlet cut 8 to 16 in. into roadbed; D, angle drain 30 to 40 degrees downward with road centerline; E, height up to 24 in; F, depth to 18 in; G, 36-48 in.

III.6 Corrugated Metal Culverts

Purpose: Corrugated metal culverts are used to remove water from roadways. They can also be used to divert water around areas or structures.

Application: Corrugated metal culverts are permanent water conveyance structures that can be used on all types of roadways.

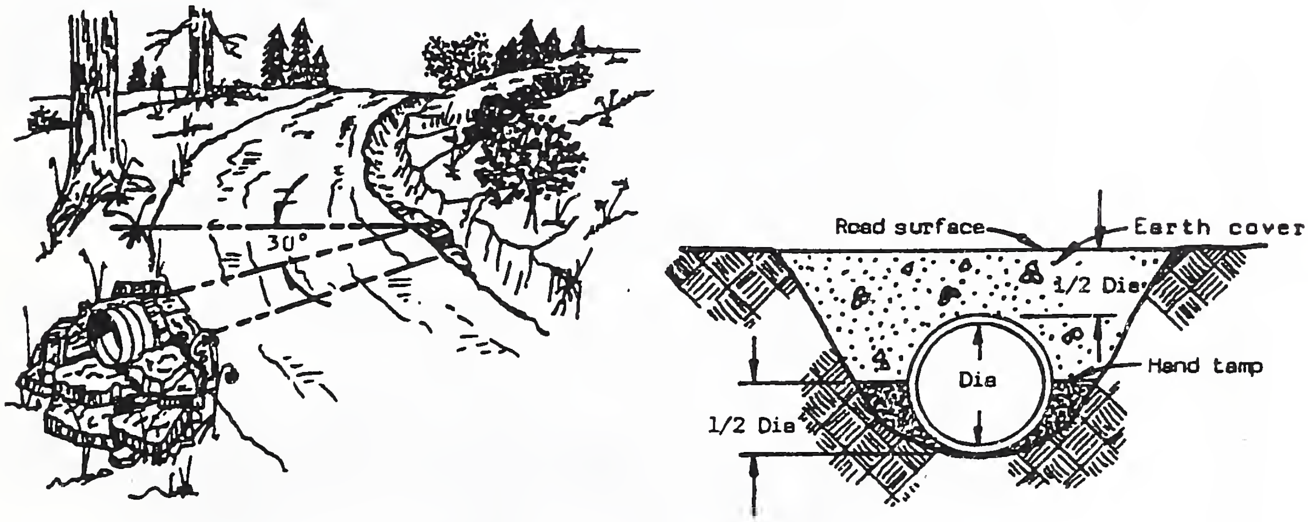
Specifications: (See Figure III-6)

1. Culverts should be long enough to reach across the roadway and extend beyond the fill slope. In addition, culvert outlets must have erosion control structures installed below them to prevent erosion.

2. When installed to convey a stream under a roadway, they should be large enough to carry the maximum stream volume as well as any additional seasonal runoff. Note: Culvert size should comply with the Idaho Department of Water Resources requirements. (See Appendix A)

3. Install the culvert in firm, compacted soil with a minimum cover of twelve (12) inches of soil.

Maintenance: Culverts need to be inspected on a regular basis. They should be cleaned and/or repaired when necessary.



SECTION

CULVERT INSTALLATION

FIGURE III-6

III.7 Drain Fields

A drain field is a drainage system that is designed to discharge infiltrating water and/or ground water away from a site.

Purpose: Drain fields can also be used to intercept and divert seeps. Drain fields must be designed with either a gravity flow outlet or the water must be discharged from the drainage system by pumping.

Application: Drain fields can be used under waste dumps, stockpiles, and tailings impoundments to transport water away from the site. By reducing the water volume and amount of time that it is in contact with potential pollution forming materials, the potential for water quality impacts can be reduced.

Specifications: (See Figure III-7)

1. Drain fields can either be constructed with clean, graded rock (rock of several different sizes), or by using perforated pipe and graded rock. Rocks and piping can also be used in conjunction with geotextile fabric.

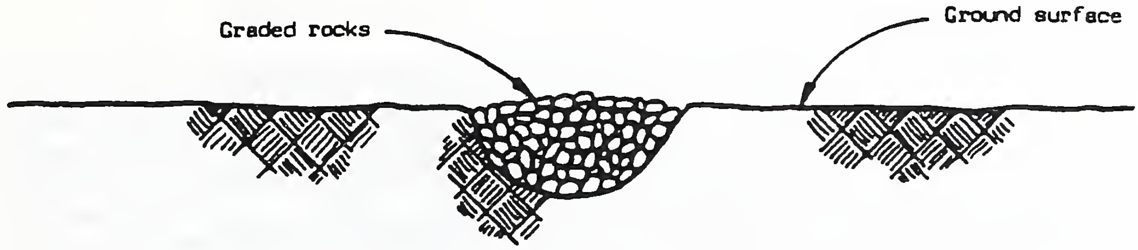
2. Drain field constructed of graded rock: Dig a trench. Line it with coarse rock or a geotextile fabric covered with coarse rock. Fill the remainder of the trench with smaller rock free of sand or soil.

3. Drain field constructed of graded rock and perforated pipe: Dig a trench. Line it with coarse rock or a geotextile fabric covered with coarse rock. Put a section of perforated pipe in the trench. (The minimum diameter of the pipe should not be less than 4 inches.) Fill the remainder of the trench with smaller rock free of sand or soil.

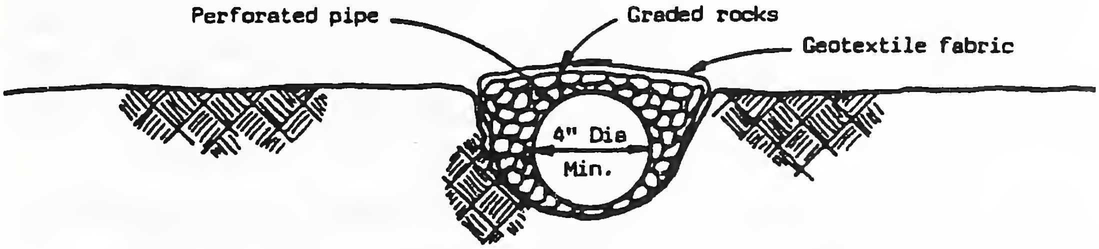
4. Do not allow fine soil, silt, or sand to come in contact with the graded rock or graded rock and perforated pipe, as it could clog the drain field and reduce its effectiveness.

5. Drain fields could be a system of interconnected , branched trenches feeding into a central drainage discharge trench.

6. The size of the drain field as well as the depth and width of the trenches is dependant on the volume of water the system must transmit. This is a site specific condition that must be determined by a qualified engineer before the drain field is built.

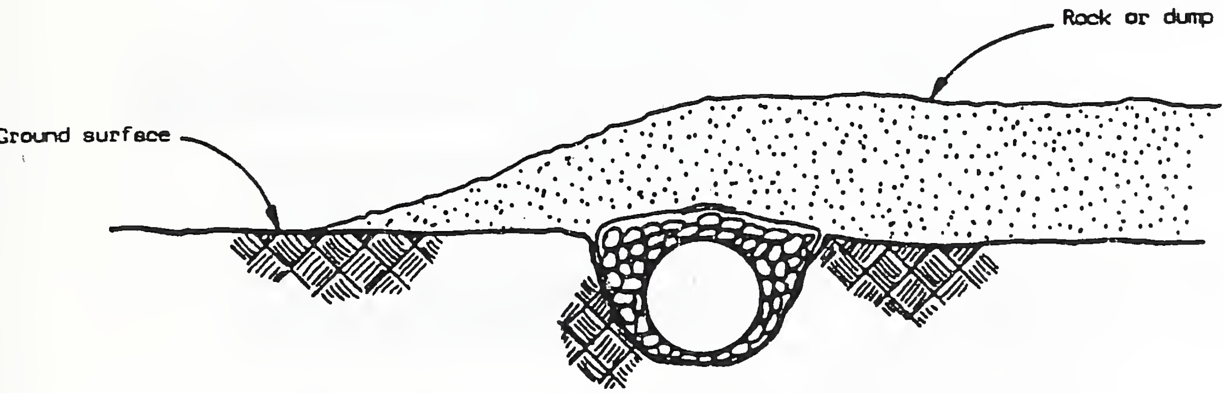


DRAIN FIELD TRENCH LINED WITH GRADED ROCKS



NOTE: Diameter of pipe to be based on the amount of water to be drained.

TRENCH LINED WITH GEOTEXTILE FABRIC,
GRADED ROCK AND PERFORATED PIPE



SURFACE WASTE OR DUMP TO BE PLACED
OVER UNDERDRAIN AFTER CONSTRUCTION

III.8 Stream Alteration

Stream alteration/diversion should be considered when streams flow through economically minable areas or to divert live water away from a pit, quarry, pond or adjacent impacted area. Stream Alterations can reduce potential water quality impacts caused by mining by routing water away from the area being actively mined. A stream diversion can either be a temporary or permanent measure. Refer to the Idaho Department of Water Resources **Rules and Regulations and Minimum Standards for Stream Channel Alterations.**

Planning:

The following information should be considered and may be required when planning a stream channel diversion:

1. Inventory the following existing stream conditions:

   a. Develop a Plan view map of the stream or streams to be relocated. Show the present and final location, of the stream, within the valley in relation to access roads, forest roads, land forms at a scale of 1" = 40' with 10' contour intervals. Show location of pools, riffles, transition zones, and natural drop structures in both channels.

   b. For the stream to be altered, inventory and list the following:

   Total pools — Channel length
   Total riffles — Valley bottom length
   Pool: riffle ratio — Sinuosity
   Gradient
   Fish count or available fisheries data
   Cross-section through entire stream length, showing gradient for each reach. Scale 1" = 40'.

   c. Develop cross-sections for each stream reach on a scale of 1" = 2', extending at least 10' beyond mean high water mark. If a reach is greater than 200' long, show a cross-section for every 200' length of reach or portion thereof.

   For each stream reach, inventory and list the following:

   Type of reach — Gradient
   Average depth — Area of reach
   Average width — Average size of bed material
   Width/depth ratio
   Cobble embeddedness
   Volume of large organic debris
   Bank stability and form description

d. Obtain or calculate flow data for the following storm events:

 2 year - 24 hour (Bankfull discharge)
10 year - 24 hour
25 year - 24 hour
50 year - 24 hour

Show a representative riffle cross-section overlaid with flood water elevations for the specific storm events.

2. Develop a reclamation plan, based on the stream channel inventory, that will provide comparable or improved stream channel characteristics, based on stream stability and fisheries habitat.

Construction Specifications:

1. Plan to relocate the stream where no mining will occur.

2. Excavate the new stream channel to specifications outlined in the stream reclamation plan and stream channel alteration permit.

3. Install erosion control, channel stabilization structures, and fisheries improvements. These items will be outlined in the stream reclamation plan and/or stream channel alteration permit.

4. Downstream control structures should be installed to help break the stream's velocity. This will enhance fish habitat, providing there are fish in the stream. (Refer to BMP III.9 Drop Structures)

5. Establish vegetative cover such as grass and willows on the banks above the water line.

6. There should be no stream diversion until a new channel has been constructed to standards specified in the stream reclamation plan.

Maintenance:

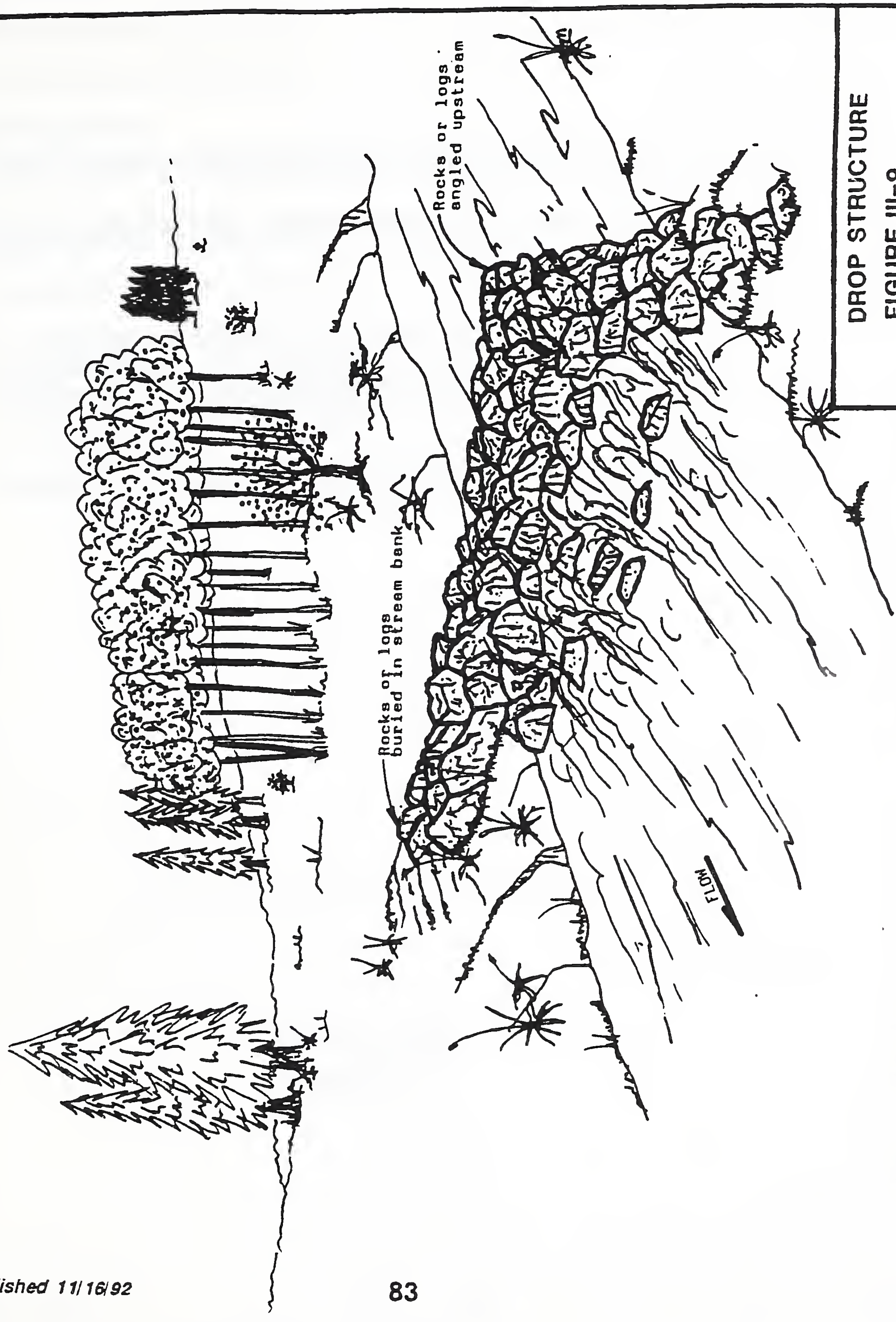
1. Monitor conditions at the altered stream and complete repair work on the channel as needed.

2. The reconstructed channel should be allowed to function for at least one year before mining is conducted in the original channel location. If serious stability problems develop in the new stream channel, flows can be returned to the original stream channel.

III.9 Drop Structures

Specifications: (See Figure III-9)

Place large, hard, angular rocks in an V shaped pattern across the width of the stream. Note: Rocks must be large enough that the water velocity does not dislodge them and carry them downstream.



DROP STRUCTURE
FIGURE III-9

III.10 Rolling Dips

Rolling dips are built into the road, during construction, using the natural contours of the land.

Purpose: Rolling Dips are designed to divert surface runoff off road surfaces.

Specifications: (See Figure III-10)

1. The dip should be approximately one (1) foot in depth from the surface plane of the road. The upgrade approach to the bottom of the dip should be approximately sixty (60) feet. The downgrade approach to the bottom of the dip should be approximately twenty (20) feet in length.

2. The dip should cross the road at nearly a 90 degree angle and should be outsloped approximately five percent.

BMP'S FOR RUNOFF COLLECTION

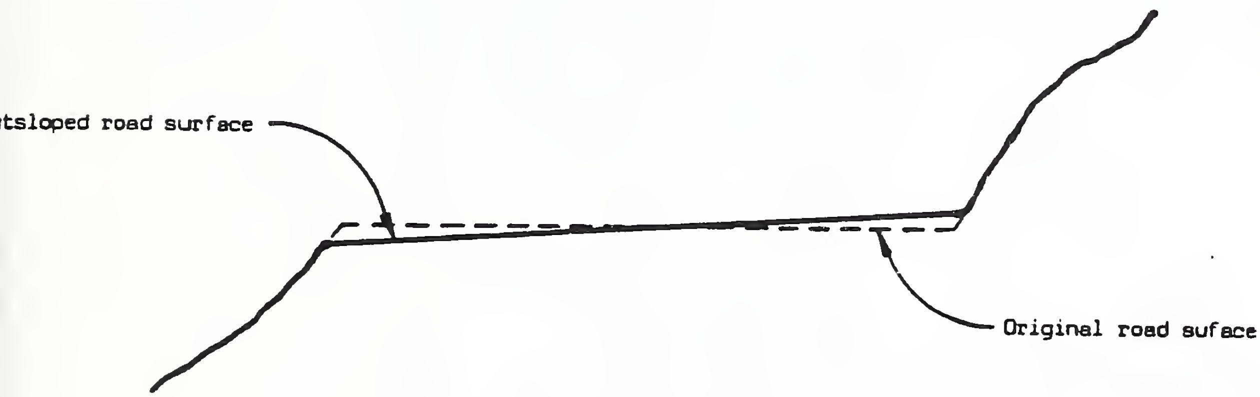
III.11 ROAD SLOPING

Road sloping is built into the road during construction.

Purpose: Sloped roads are designed to divert surface water off the entire road surface so that water does not concentrate in any specific location.

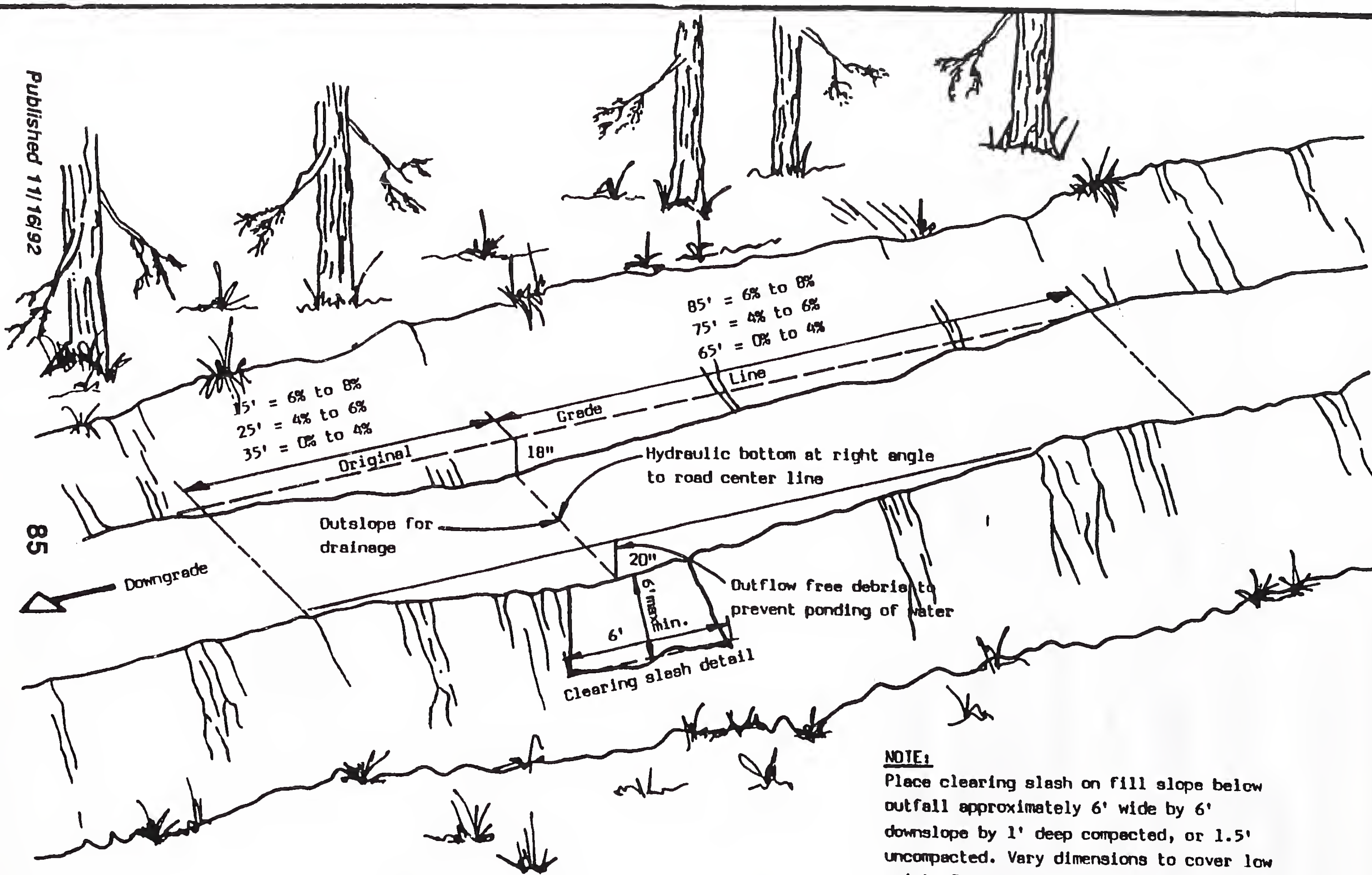
Specifications: (See Figure III-11)

1. The slope should be approximately 1-2% from the cut slope to the fill slope.
2. Berms on the outside of the road should be limited or removed to allow water to flow off the road surface.
3. A slash filter windrow should be used at the toe of the fill slope to prevent excessive erosion and sediment transport. (See BMP V.7)



ROAD SLOPING

FIGURE III-11



NOTE:
Place clearing slash on fill slope below outfall approximately 6' wide by 6' downslope by 1' deep compacted, or 1.5' uncompacted. Vary dimensions to cover low point of road grade (for example 12' wide by 3' long by 1' deep).

ROLLING DIP DETAIL
FIGURE III-10

III.12 Roadway Surface Water Deflectors

A roadway surface water deflector is a runoff interceptor built of treated wood and a conveyor belt. The deflector is installed across the roadbed to convey surface water off the roadbed.

Purpose: To deflect surface water off roadways to reduce erosion. The deflector can be installed on lightly used, unpaved roads with steep grades (greater than six percent).

Specifications: (See Figure III.12)

1. Obtain a section of two-ply rubber conveyor belt 12 inches (wide) x 20 feet (long) x 1/4 inch, more or less, 1/16 inch (thick) and (2) 2 inch x 6 inch x 20 feet pieces of treated lumber.

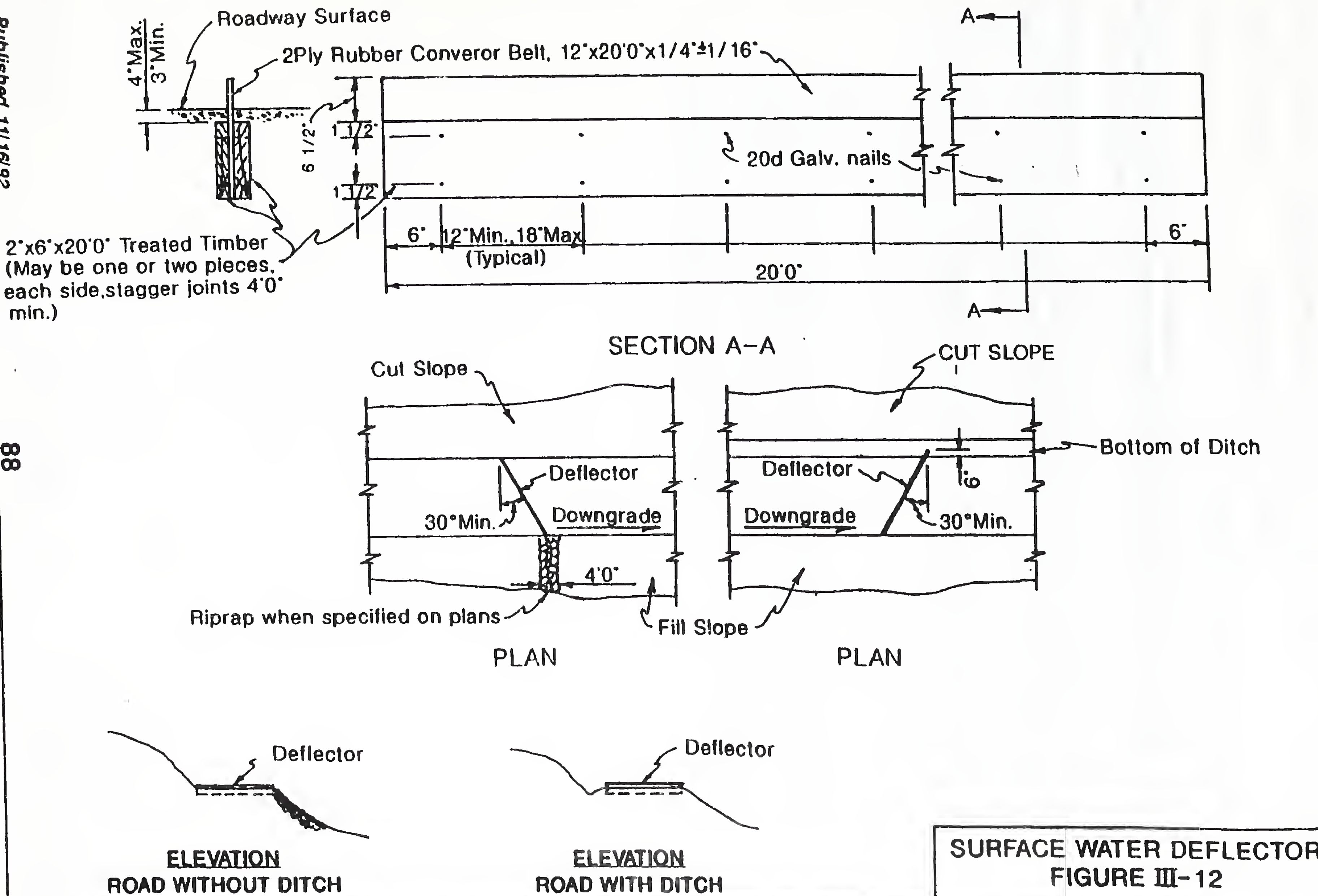
2. "Sandwich" the conveyor belt between the two pieces of treated lumber so one edge of the conveyor belt is flush with the bottom of the treated lumber. Nail the treated lumber together with 20 d galvanized nails. The conveyor belt should extend 6 inches, more or less, above the top of the nailed together treated lumber.

3. Excavate cut in roadway at a 30° angle to the road surface.

4. Install deflector so that the treated lumber is 3 inches - 4 inches below the surface of the road (this will allow 2½ inches - 3½ inches of the conveyor belt to project above the road surface). Burying the lumber as specified will help prevent damaging it when the road is graded.

Maintenance: These water deflectors should be inspected on a regular basis and should be repaired or replaced as needed.

ROADWAY SURFACE-WATER DEFLECTOR SPECIFICATIONS



SURFACE WATER DEFLECTOR
FIGURE III-12

Section IV: BMP'S FOR RUNOFF DISPERSION

Contents and Applicability

Best Management Practices (BMP's):

IV.1 Serrated Slopes. Small steps on a slope face which are useful for providing favorable sites for establishment of vegetation and controlling runoff. This method is limited to soils that have medium to high cohesion properties.

IV.2 Benched Slopes. Large steps in a slope face useful for providing favorable sites for establishment of vegetation and controlling runoff. Benches can help stabilize large excessively steep slopes in highly cohesive material. This method is most applicable in newly constructed areas.

IV.3 Level Spreader. An outlet constructed, at zero grade, across a slope to help disperse concentrated runoff, allow for water infiltration, and allow sediment to settle out of the water.

IV.1 Serrated Slopes

Serrating slopes involves cutting small (1-2 ft) horizontal steps in a hillside.

Purpose: Serration reduces slope lengths, breaks up and loosens soils so that seeds can take hold, and establishes favorable sites for revegetation and water infiltration.

Specifications:

Serration (Scarifying): These techniques work best on cohesive soils or soft rocks that can be excavated without ripping. Slopes must be gentle, preferably 2:1 or flatter.

1. Serrated slopes can be built with a dozer.
2. Serrations should be horizontal and should follow the contour of the slope.
3. Excavation of a series of serrated benches should be in opposite directions, from the top of the slope to the bottom, so that the build up of loose material at the end of the bench can be minimized.
4. Serrated/scarified ground should be seeded as soon as possible after the excavation work has been completed.

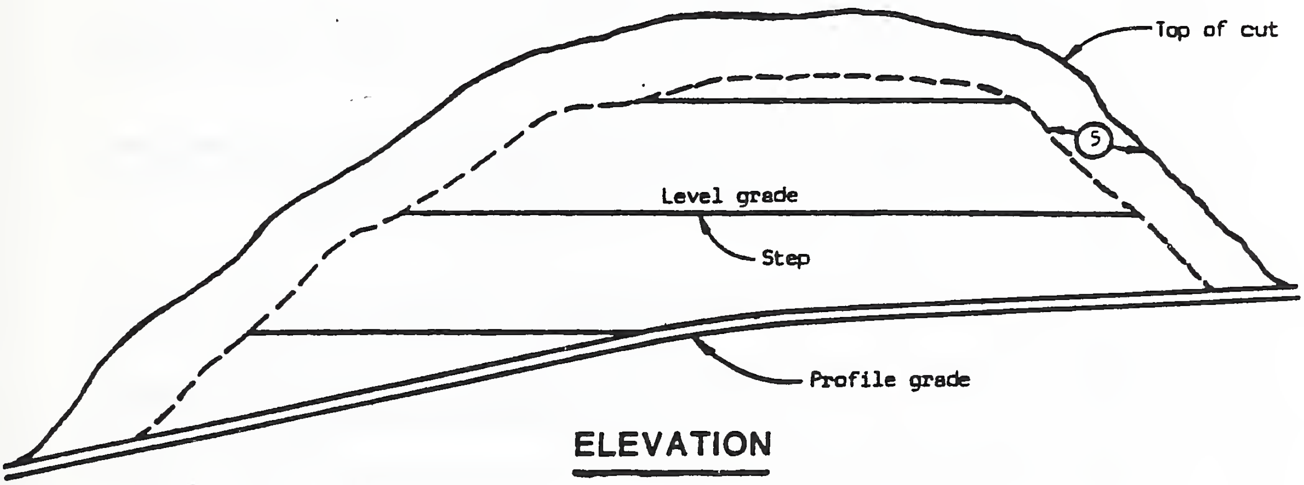
IV.2 Benched Slopes

Benching slopes involves constructing continuous horizontal benches on a slope to reduce slope lengths, enhance stability, and revegetative efforts.

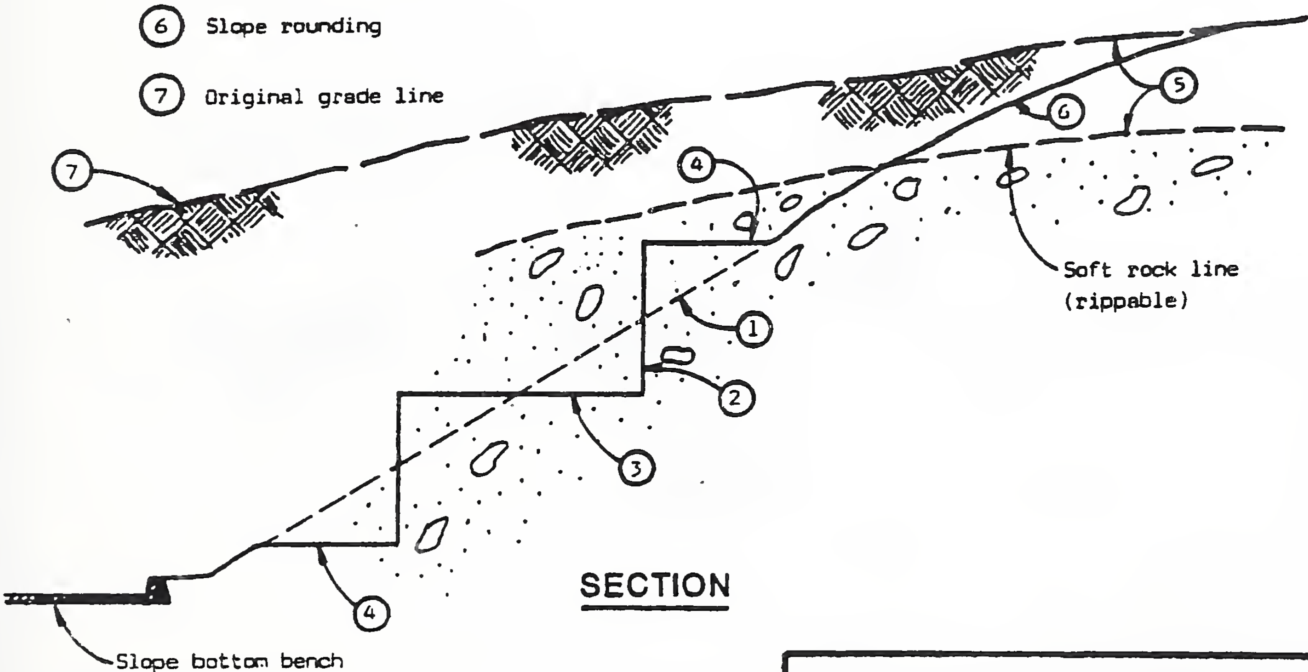
Application: Slope benching is applicable in new construction on cut slopes in soft rock that can be excavated by ripping. This method does not work well on cut slopes excavated in soft rock where the bedding lies perpendicular to the cut slope.

Specifications: (See Figure IV-2)

1. The vertical cut of the bench should be between two (2) feet and four (4) feet high.
2. The vertical cut of the upper bench or terrace should begin immediately above the horizontal cut of the lower terrace.
3. Benches should be horizontal. They should parallel the roadway or cut slope.
4. Excavation of each bench should be in an opposite direction from the preceding one, from the top of the slope to the bottom, to reduce the build up of unconsolidated material at the end of the bench.



1. Staked slope line
2. Step rise height 2 - 20 feet; in soil 2 - 4 feet, in rock 2 - 20 feet
3. Step tread width = Slope ratio X step rise
4. Step termini width = 1/2 step tread
5. Overburden
6. Slope rounding
7. Original grade line



Published 11/16/92

BENCHED SLOPES
FIGURE IV-2

IV.3 Level Spreaders

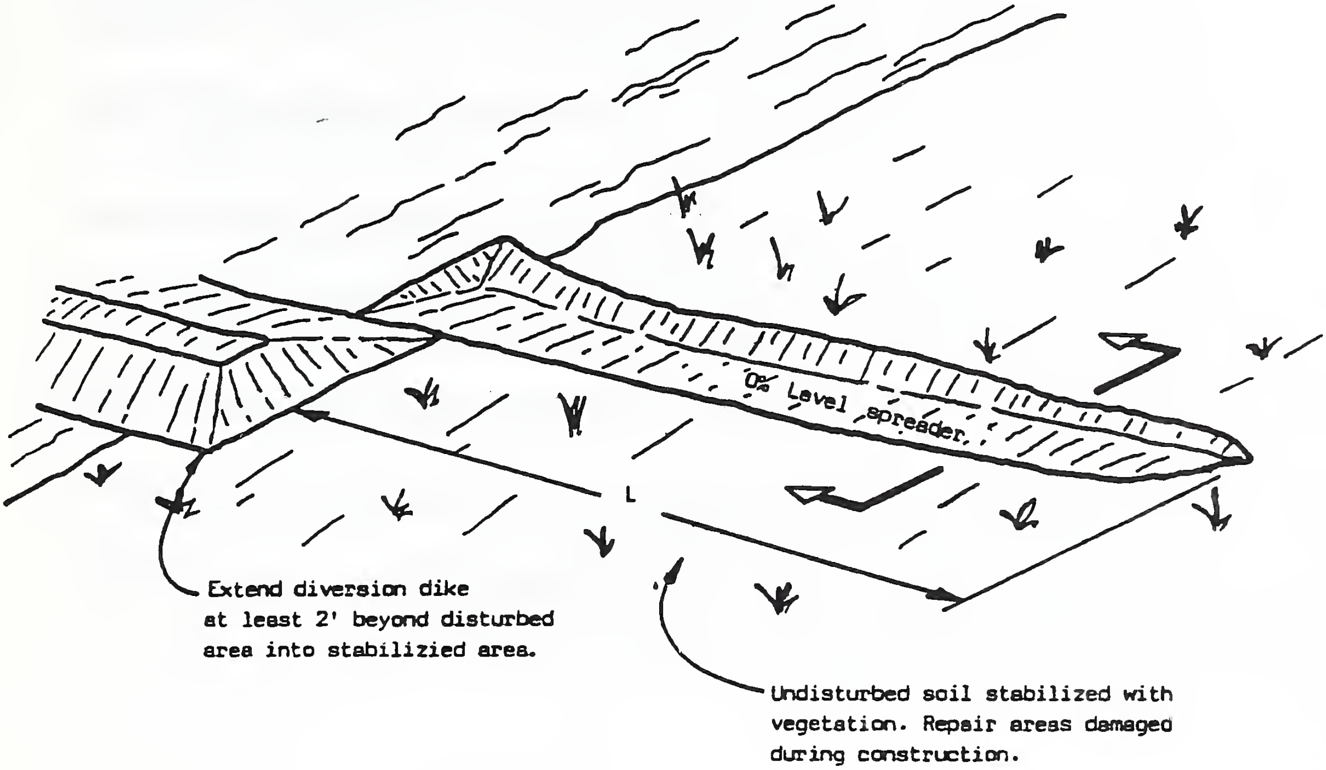
Level spreaders are designed to disperse surface runoff over a wide, relatively flat area.

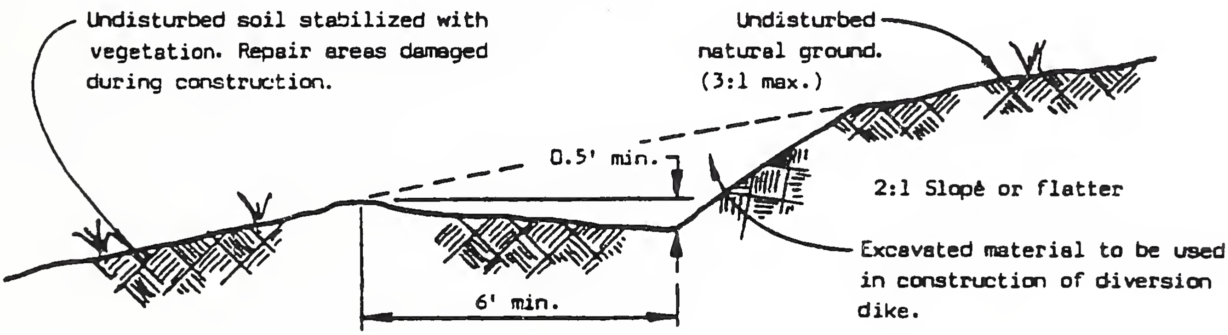
Purpose: Runoff velocities can be reduced by using level spreaders. Reduced velocities lessen erosion, allow sediment to settle out of runoff water and enhance infiltration.

Application: Level spreaders can be used in locations where concentrated runoff from unvegetated ground needs to be controlled, the water velocities dissipated, and the water dispersed over a broad surface area.

Specifications: (See Figure IV-3)

1. Level spreaders should be constructed in undisturbed soil.
2. Length - The level spreader should be at least fifteen (15) feet long for every .10 cfs (cubic foot per second) discharge of water.
3. Width - A minimum of six (6) feet from the centerline to the outside edge of the level spreader.
4. Level spreaders should not be built on slopes steeper than 3:1 (approximately 33%).





SECTION

LEVEL SPREADER
FIGURE IV-3

Section V: BMP'S FOR SEDIMENT COLLECTION

Contents and Applicability

Best Management Practices (BMP's):

V.1 Straw Bale Barrier. Straw bales can be used where temporary diversions or berms are required. The straw allows water to filter through and retains the sediment. Frequent inspection is necessary.

V.2 Sediment Traps or Catch Basins. A basin for capturing sediment from runoff water.

V.3 Vegetated Buffer Strip. An undisturbed area containing native vegetation over which runoff water flows before entering streams or lakes.

V.4 Silt Fence/Filter Fence. A barrier constructed of filter cloth which is designed to trap sediments while allowing runoff water to flow through the barrier.

V.5 Brush Sediment Barriers. A sediment barrier constructed of brush or brush and filter fabric.

V.6 Sediment/Settling Ponds. A pond constructed, in a drainage or draw, which catches and holds sediment laden water.

V.7 Slash Filter Windrows. A sediment trap built of windrowed slash.

V.8 Log and brush check dams. A sediment trap built of logs and brush.

V.1 Straw Bale Barriers

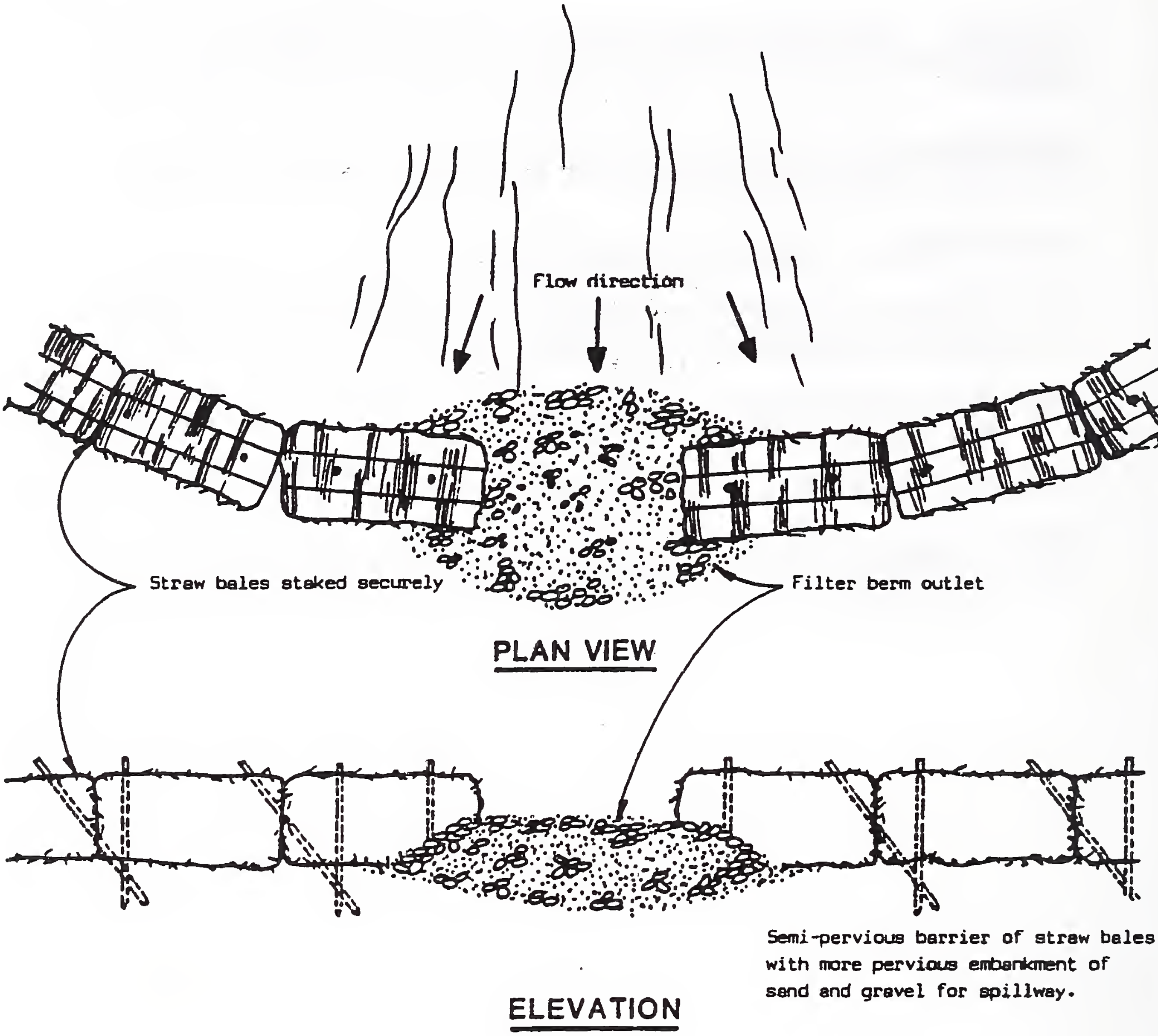
Purpose: Straw bales can be used as a temporary berm, diversion, or barrier to help contain sediment on site by catching and filtering spring runoff.

Application: The barriers may be used across small swales, in ditches, and at the toe of bare slopes where there is a temporary, large volume of sediment laden runoff.

Specifications: (See Figure V-1A and V-1B)

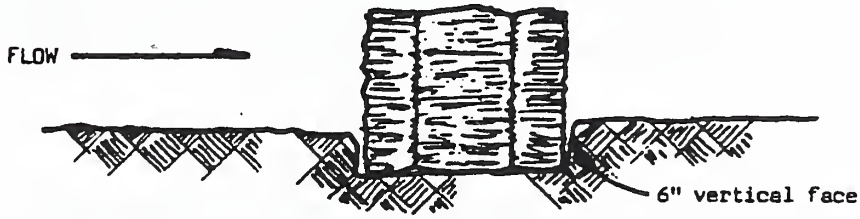
1. Bales should be laid on their side and staked in place with either wooden or metal stakes. The stakes should be driven through the bale and at least one (1) foot into the ground.
2. Piping (flow of water underneath the bales) can be reduced by placing the bales in a small (six inches deep) trench.
3. Wire or nylon tied bales last longer than bales tied with twine.

Maintenance: Straw bale sediment barriers should be inspected on a regular basis and immediately repaired or replaced when damaged.

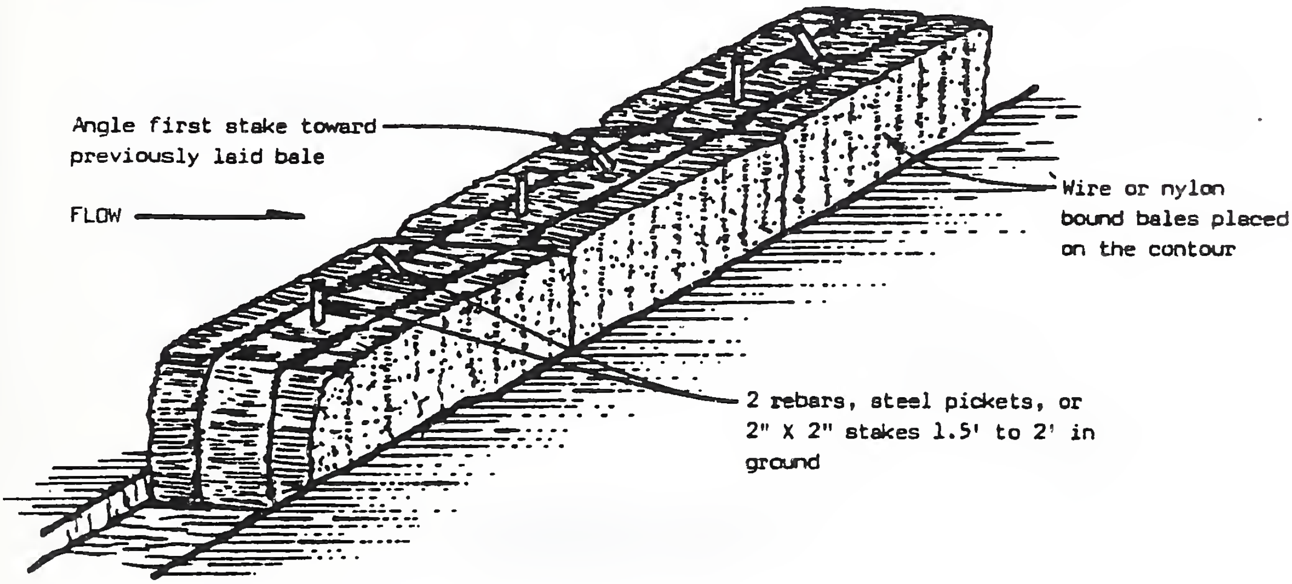


STRAW BALE BARRIER

FIGURE V-1A



EMBEDDING DETAIL



ANCHORING DETAIL

STRAW BALE SEDIMENT BARRIER

FIGURE V-1B

V.2 Sediment Traps or Catch Basins

A sediment trap or catch basin is a temporary or permanent structure used to catch and store sediment laden surface runoff.

Purpose: Small temporary structures should be used to catch runoff containing sediment from temporary roads and construction sites. Larger permanent basins should be constructed to catch periodic sediment laden runoff from permanent erosion control structures, i.e. culverts, water bars, etc.

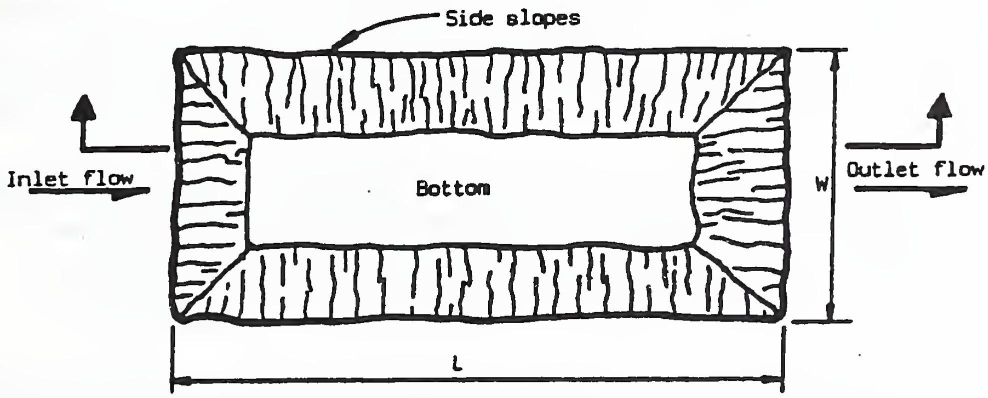
Specifications: (See Figure V-2)

1. The basin should be large enough to retain sediment from major seasonal storm events. It will need to be cleaned periodically during periods of high runoff and each fall.

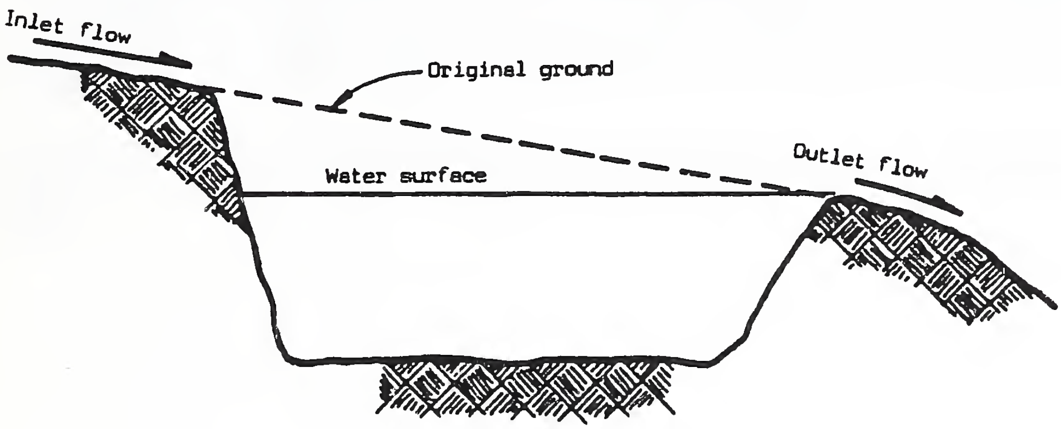
2. The slopes of the catch basin should be seeded, if possible. This will increase their stability and help decrease additional erosion.

3. Large, permanent structures may require spillways so water can be decanted. Either a pipe spillway, which discharges to vegetated ground, or a natural outflow covered with geotextile fabric is acceptable.

Maintenance: Catch basins should be inspected on a regular basis and should be cleaned out and/or repaired as needed.



PLAN VIEW



SECTION

SEDIMENT TRAPS OR CATCH BASINS

FIGURE V-2

V.3 Vegetated Buffer Strip

Purpose: Vegetated ground can serve as a permanent or temporary trap to catch and hold sediment from runoff water flowing across it.

Application: A strip of vegetated ground could be established at many locations between the source of sediment and live water sources. The vegetative cover could be either native or planted.

Specifications:

1. Try to direct sediment laden water onto naturally vegetated or planted ground.

2. Tall, dense stands of grass form good sediment traps, as do willows and alder. The willows and alder can either be native or planted. A combination of grasses and willows or alder is also effective.

3. Fertilizing seeded or planted ground will enhance growth.

4. Sediment laden water should not be directed onto vegetated buffer strips within 25 feet of a Class II stream or within 75 feet of a Class I stream.

Maintenance: Native vegetated ground should not need maintenance. Planted ground should not be used as a sediment trap until vegetation is well established. The area should be inspected periodically to ensure that water running across the vegetated ground is not causing additional erosion.

V.4 Silt Fence/Filter Fence

A silt fence/filter fence is a low fence made of filter fabric, wire, and steel posts used to filter sediment out of runoff water before it is discharged.

Purpose: Silt fences should be used on sites where there is a potential for sediment laden runoff caused by man made surface disturbance to be discharged.

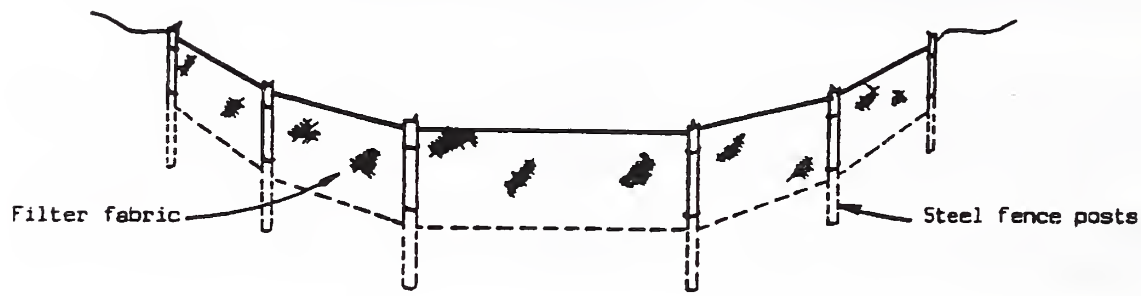
Application: Silt fences should be used on small ephemeral drainages where surface water collects or leaves a mine site. Silt fences are easier to maintain and remove without creating lasting impacts to the environment. They must be cleaned periodically to maintain their effectiveness.

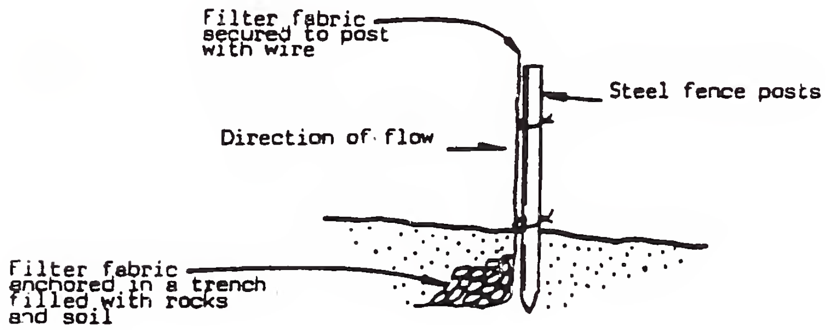
Specifications: (See Figure V-4)

1. Construction material: filter fabric, steel fence posts, wire.
2. Excavate a trench at the uphill side of the planned fence location to a depth of at least six (6) inches.
3. Drive steel fence posts into the ground, to a depth adequate to make the fence stable, on the downhill side of the trench.
4. Stretch the filter fabric between the posts and wire it in place.
5. Lower the fabric into the trench and cover with rocks and compacted soil so water can not wash out under the fabric.

Maintenance: Silt fences should be inspected periodically, especially during periods of high runoff. They should also be cleaned and repaired on a regular basis and every fall.

Silt fencing may not be as effective as straw bales in areas with a high clay content as the clay tends to clog the filter fabric and impede the flow of water.





SECTION

SILT FENCE/FILTER FENCE

FIGURE V-4

V.5 Brush Sediment Barrier

Purpose: Barriers constructed of brush or brush and filter fabric can serve as an effective sediment trap if runoff water is diverted through them.

Application: Brush sediment traps can be an effective permanent or temporary erosion control structure and are used below any surface disturbance. Brush sediment barriers can also enhance reclamation efforts by providing a source of slash to regrade over the mine site, before seeding.

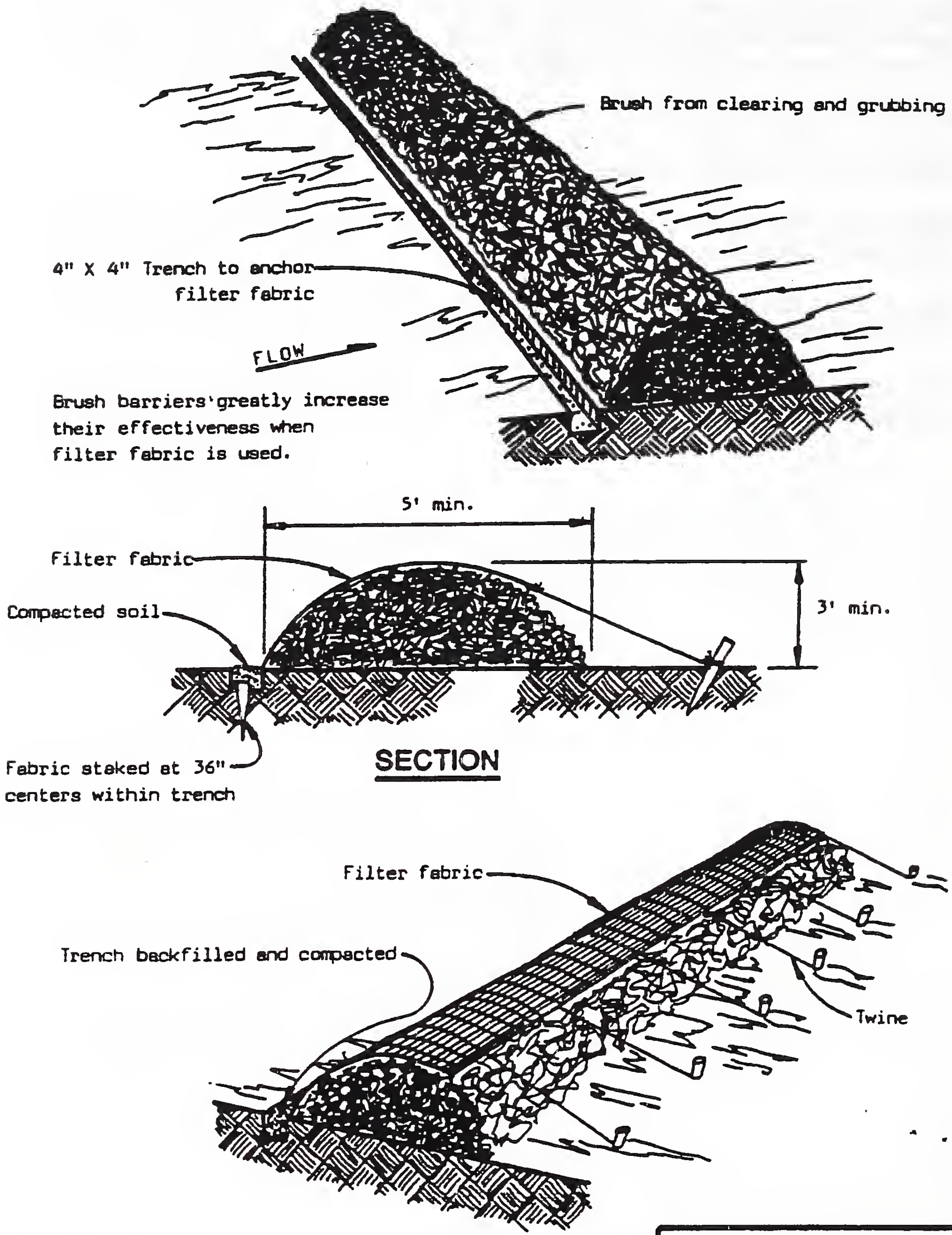
Specifications: (See Figure V-5)

1. Pile brush in a semi-circle on the ground.

2. Dig a four-inch by four-inch trench on the uphill side of the brush pile adjacent to the pile.

3. Place filter fabric in the trench. Cover and compact with soil and rocks so water will not run under the fabric.

4. Place the filter fabric over the brush pile. Anchor in place as shown in Figure V-5.



BRUSH SEDIMENT BARRIER
FIGURE V-5

V.6 Sediment/Settling Pond

Purpose: Sediment ponds can serve as effective sediment traps, holding and storing sediment laden water for long periods of time. They can be designed with a spillway so that sediment free water can be allowed to decant off during periods of peak flow. Excess sediment free water could also be removed from the settling pond by land application, which entails dispersing it onto vegetated ground through pipes and a sprinkler system.

Application: Sediment/settling ponds are effective permanent holding facilities for sediment laden water that runs off a mine site. They can also be used to catch and retain water discharging from diversion dikes and drain fields, and they can be built below tailings dams to catch and hold seepage that might contain toxic substances.

Specifications: (See Figure V-6)

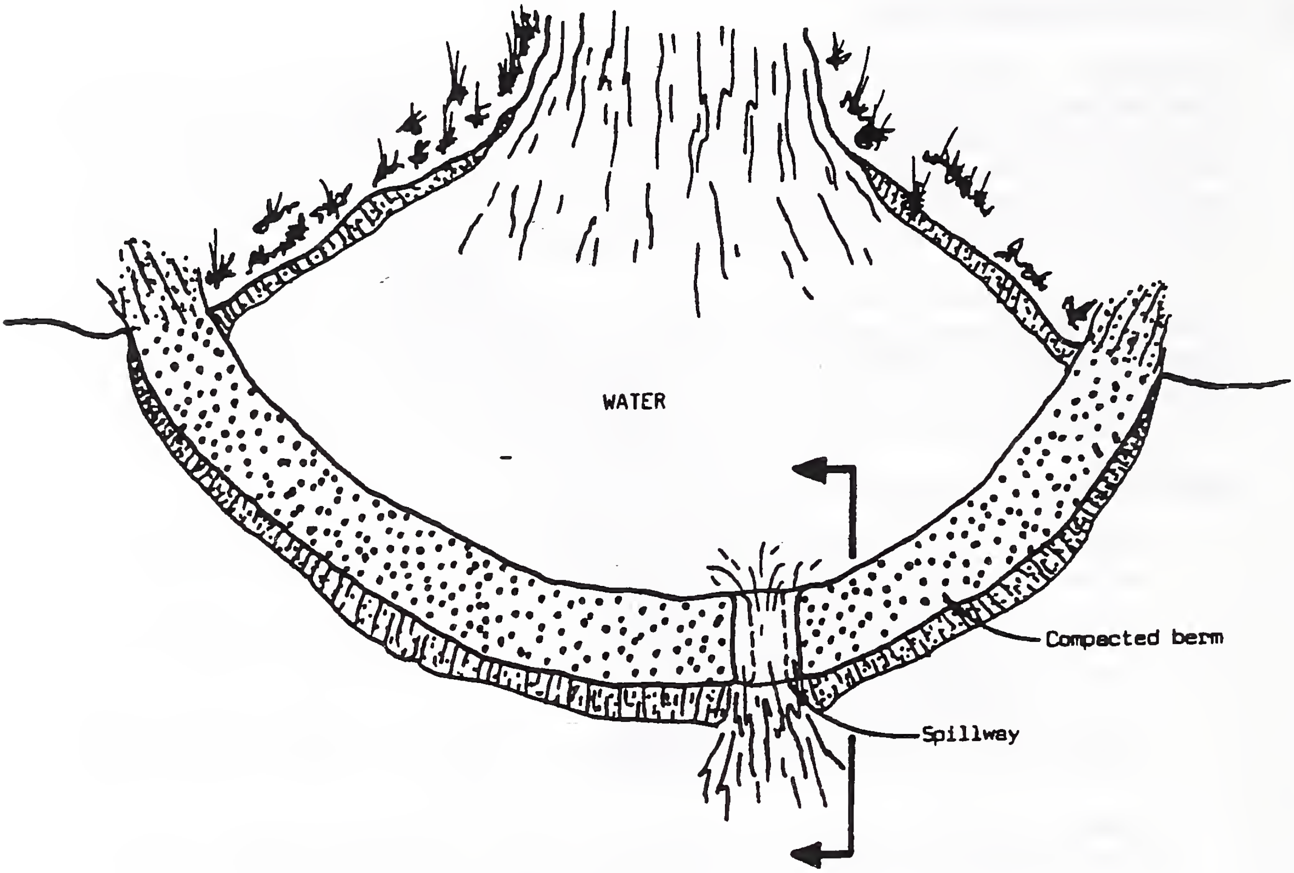
1. Construct a well compacted semi-circle shaped berm at the lowest collection point on a bare slope.

2. Make the base of the berm wider than the top. This will increase its strength.

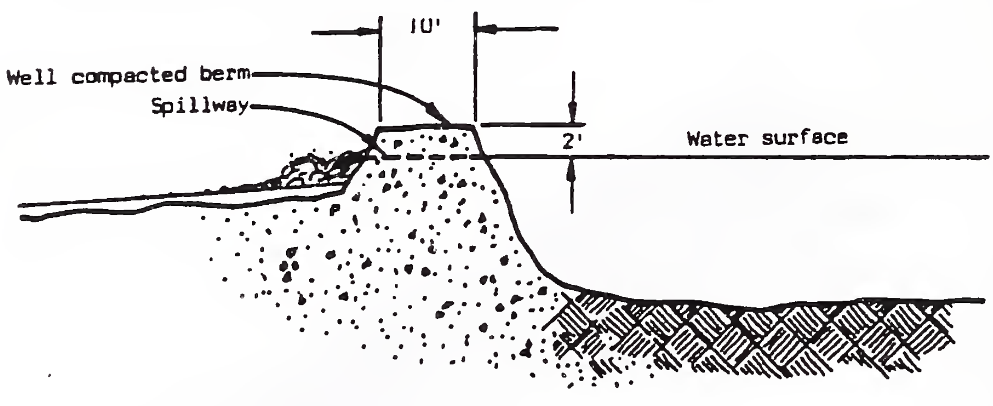
3. Build the berm high enough so that the pond can retain all runoff water and any excess from a major storm event.

4. Design a spillway into the berm so that sediment free water can be decanted off if necessary. The berm could be a sloped ramp, covered with jute matting, or a wooden, rock riprapped or concrete spillway.

Maintenance: Sediment ponds should be inspected on a regular basis, especially after peak runoff periods. Repairs should be made when needed.



PLAN VIEW



CROSS SECTION

SEDIMENT/SETTLING POND

FIGURE V-6

V.7 Slash Filter Windrow

A slash filter windrow is a sediment barrier comprised of "windrowed" slash.

Purpose: Designed to catch and trap sediment coming off un-vegetated ground.

Application: Slash filter windrows are used to catch and retain sediment along road fill slopes at the toe of waste dumps, or adjacent to bare ground in steep terrain.

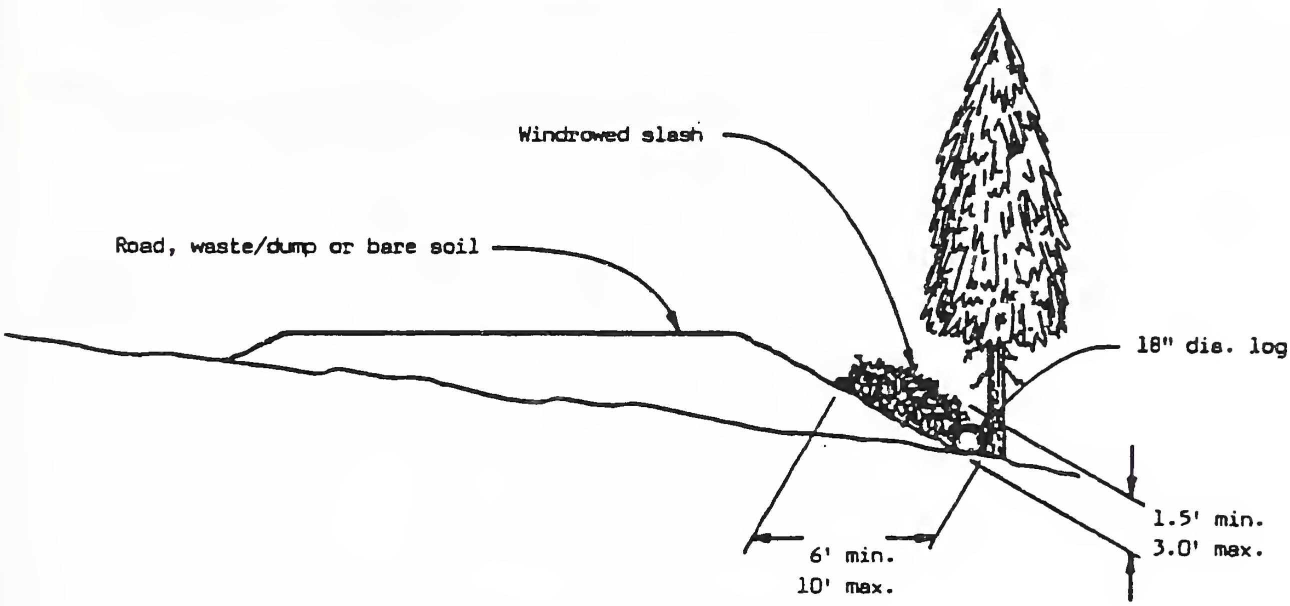
Specifications: (See Figure V-7)

1. When clearing an area of trees, stockpile the slash at designated sites so that it will be readily available for windrow construction.

2. Construct the windrow by removing a cull log of at least eighteen (18) inch diameter from the stockpile. Place it in a position at the toe of the fill or waste dump. The long dimension of the log should be parallel to the fill. Anchor the log in place against stumps, rocks, or other trees.

3. Stockpile slash on the fill slope, above the cut log. Compact the slash by tamping it in place with the bucket of the construction equipment you are using. Slash needs to be tamped in place so material will not flow under or through it.

Effectiveness: Slash filter windrows constructed below logging roads have proven to be from 75 to 85% effective in catching and retaining sediment.



SLASH FILTER WINDROW

FIGURE V-7

V.8 Log and Brush Check Dams

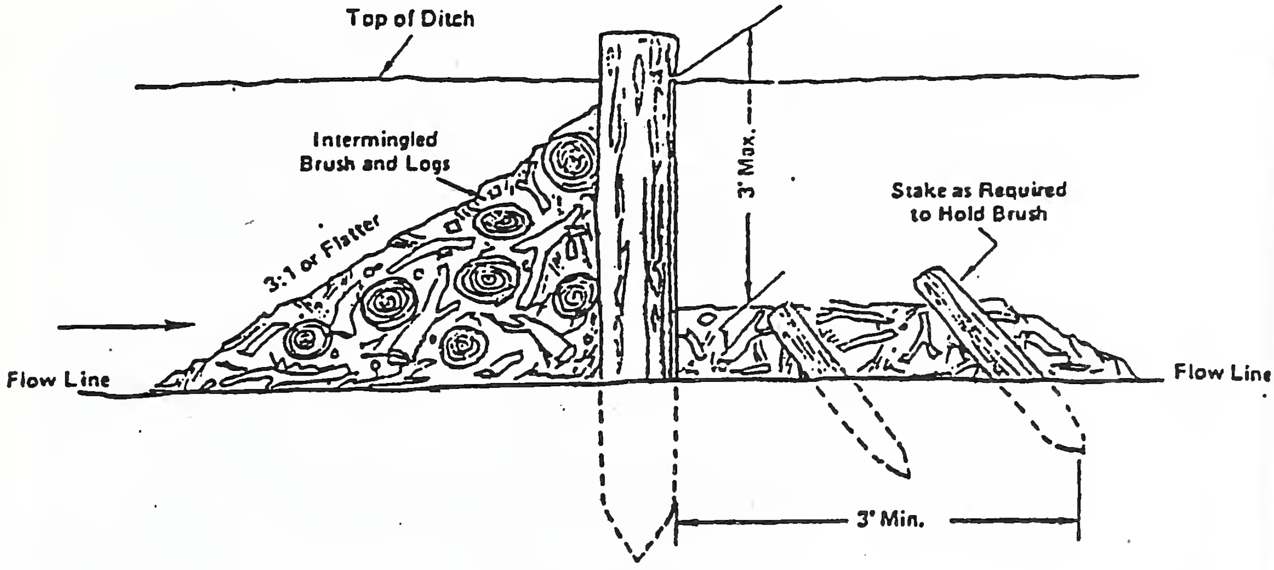
Purpose: Log check dams can be used to prevent or reduce erosion of banks and bottoms of channels, streams, and drainage-ways by reducing gradients and flow velocities.

Application: Log check dams can be installed in streams, channels, drainage-ways and ditches. Note: check dams can also be made using rocks, or wire fencing (see Figure V-8B or V-8C).

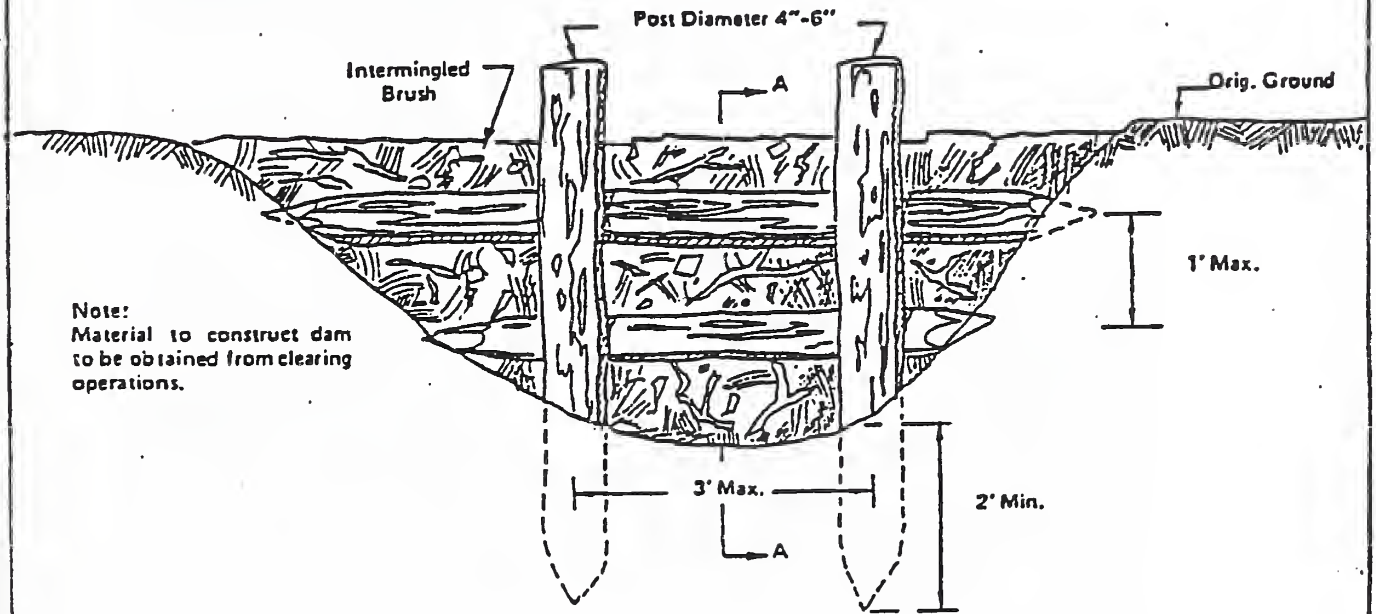
Specifications: (See Figure V-8A)

1. Check dams should be designed by an engineer. Typical specifications for log and brush check dams are shown in Figure V8-A.
2. Evaluate the gradient of the channel above and below the proposed dam site, prior to installation, to determine if erosion or sediment deposition will be a problem.
3. Locate the check dam in a straight section of the stream, channel, drainage-way, or ditch.
4. Drive 4" - 6" diameter posts into the bed of the channel to a minimum depth of 2 feet.
5. Maximum distance between posts should not exceed 3 feet from centerline to centerline of each post.
6. If using logs and brush, abut several logs against the posts, perpendicular to the flow. Logs should be a maximum of 1 foot apart. Pile brush and logs up behind dam as shown in Figure V-8A.

Maintenance: Check dams should be inspected periodically and repaired if necessary.



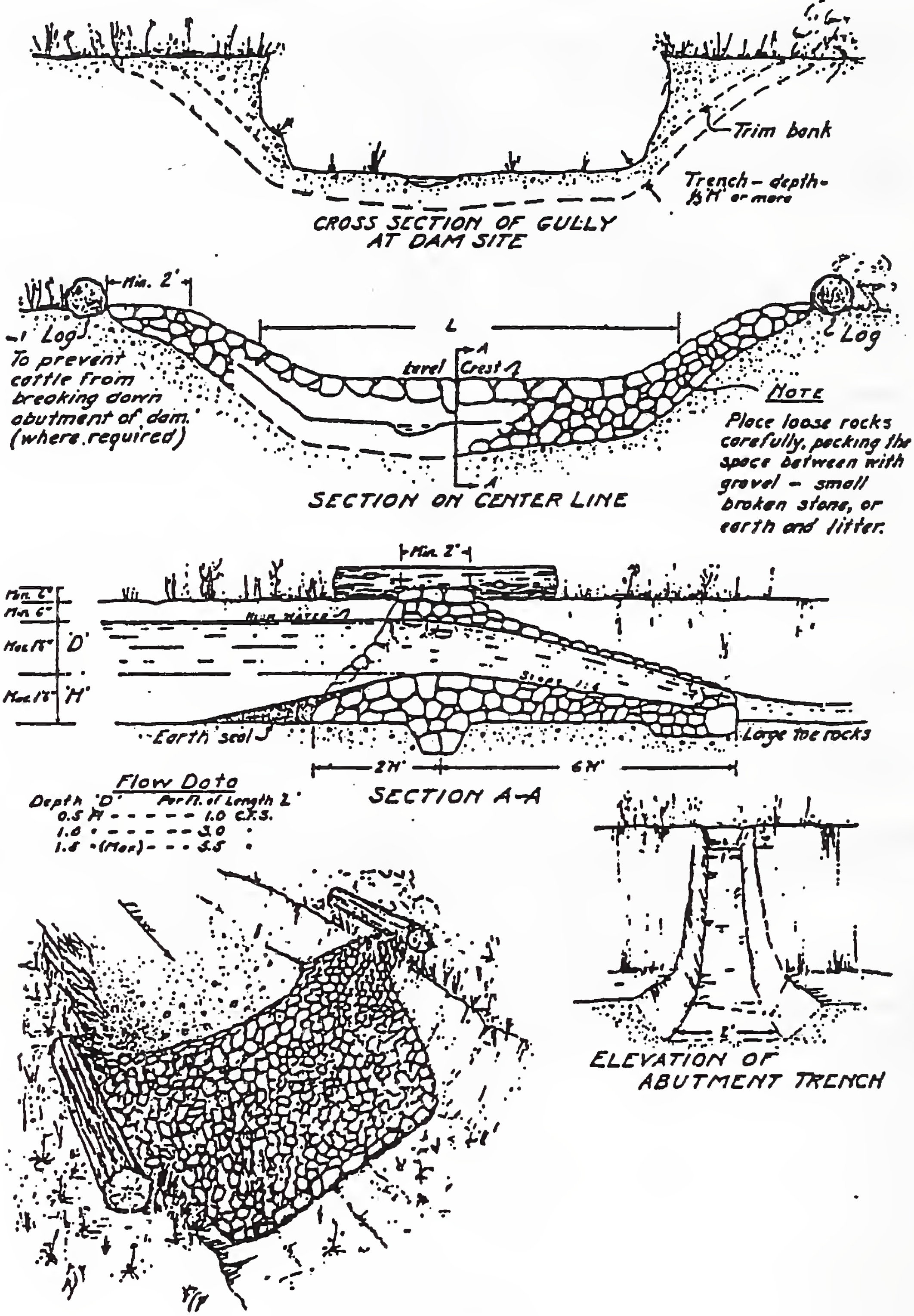
SECTION A-A



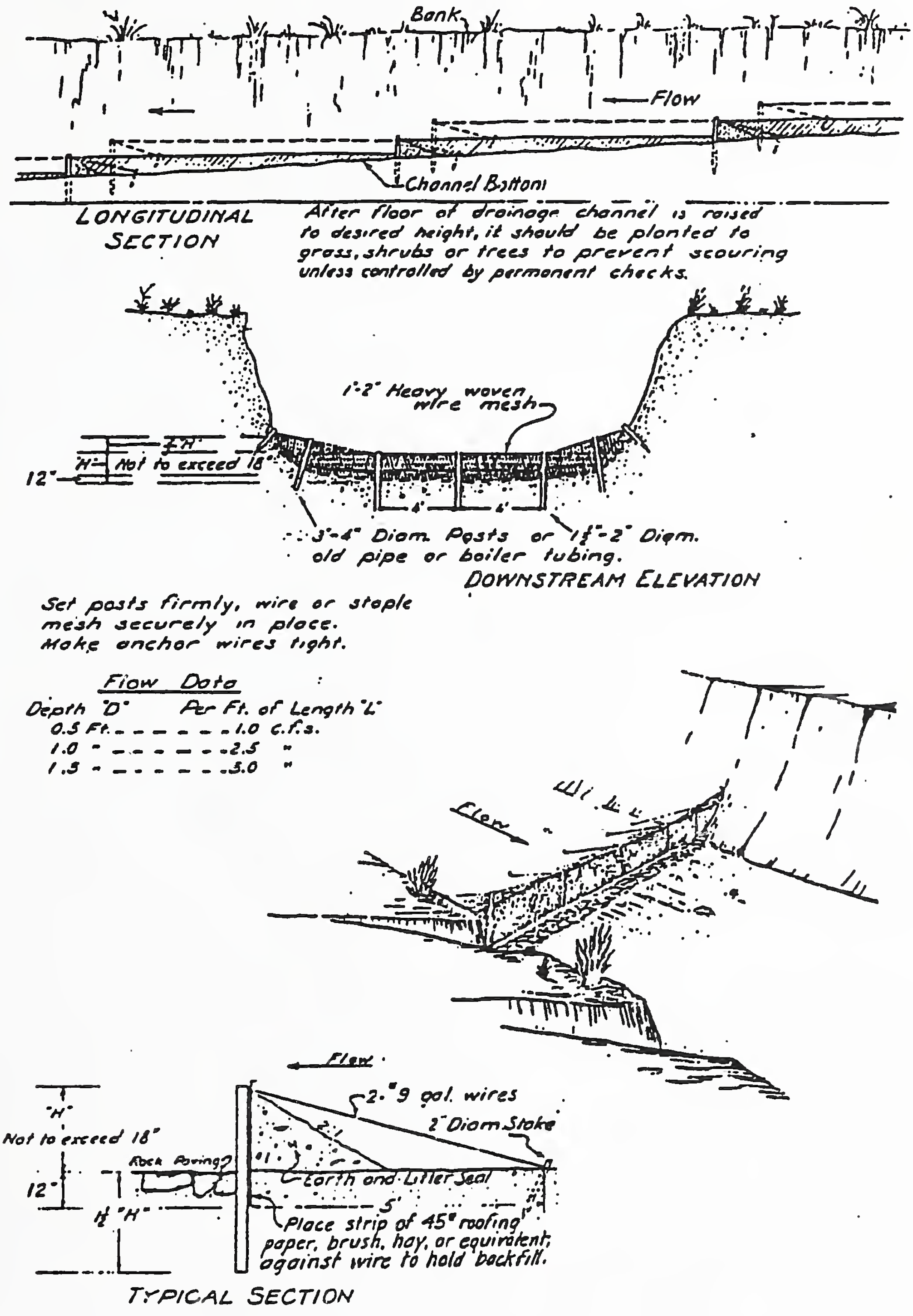
Note:
Material to construct dam to be obtained from clearing operations.

ELEVATION VIEW

LOG AND BRUSH CHECK DAM
FIGURE V-8A



LOOSE ROCK CHECK-DAM
FIGURE V-8B



WIRE FENCE CHECK DAM
FIGURE V-8C